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NOTE. The Intelligence contained in the present Bulletin has been taken exclusively from the periodicals, bulletins, and other publications which have reached the Library of the Institute of Agriculture in Rome during the months of January and February 1913.

The Bureau assumes no responsibility with regard to the opinions and the results of experiments outlined in the Bulletin.

The Editor's notes are marked (Ed.).

FIRST PART.
ORIGINAL ARTICLES

**Agricultural Economy of Japan: Principal Features;
Present Conditions of Production.**

by
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giving the following description, the author takes as geographical the so-called "Old Japan," that is, the Main Island, Shikoku, Kyūshū, and the small islands, but not Hokkaido, the Loochoos, the acquired domain in Formosa, nor the continental colonies. Since the Country is so greatly extended from south to north, the natural products obtainable within the limits of "Old Japan" are numerous, including many of a sub-tropical nature side by side the staples of the temperate zone. Moreover, varied formations of underlying rocks give rise to so many of soils, that the full study of the agronomy of the Country is, as we readily supposed, by no means an easy task. At one point, however, every part of the "Old Japan" is alike, that is in the great number of small farmers on holdings that are too small. It is a striking fact and one strange for so old a country, excluding Hokkaido, only 17.5 % of the total area is under cultivation. Putting the population at 50 000 000 of which 60 % belong to rural population, it is no wonder that the average size of a farm which a family with 4 to 7 members must subsist, is only 1 *cho* (about 15 acres). This gives rise to an intensive system of farming, or rather cultivation, for little is done in the way of raising livestock except by districts or on waste lands that cannot easily be tilled. The so-called "Areas under Cultivation," which are by far the most important from an economic point of view, are mostly devoted to the

cultivation of cereals and other important staples, and not to in crops. Evidently, much labour is needed and fertilisers must be abundantly used for this purpose. The system of land tilling remains primitive and the work is done mostly by hand, although the use of domestic animals for agricultural operations is so needed. Farmers do not venture to purchase efficient farm implements of modern type, as they are too expensive and they might not pay. In one word, the hand is the principal factor in cultivation, and "Spade Farming" is an apt designation of the system of farming throughout the Country.

Cultivation of grain crops. — Rice is the most important and the most extensively cultivated crop, the acreage of "ta" or paddy fields, land specially devoted to it, being 2 880 000 cho, that is more than 1/3 of the total area under cultivation, estimated at 5 660 000 cho including Hokkaido and the Loochoos. Moreover it is cultivated in ordinary or upland fields where upland rice is grown. Indeed in paddy fields other crops such as rushes for matting are cultivated to some extent instead of rice, but in warmer parts rice is often grown as their after crop.

The greatly increased price of rice may make it feasible to bring into cultivation waste areas which have remained so owing to lack of water for irrigating purposes. An outlay of capital for irrigating ditches would bring a large area into use for the production of rice. Even on the slopes terraced high up for the cultivation are one of the striking features in the landscape of the Country. Where water is available, the paddy field is never absent, although in the northern sections of the Empire the industry is risky as the summer is not sufficiently long, the limit of Hokkaido, or more exactly 44° N. being the limit of this crop.

The labour necessary for laying out of rice field, sowing, transplanting, weeding, and harvesting is that of 20 to 40 hands for an area of 1 *tan* (1/4 acre); a good yield for one *tan* is 3 *koku* (1 *koku* = about 5 bushels) or even to 4 *koku* on the best fields.

The average annual crop of rice in Japan is considered to be 50 000 000 *koku*; the actual production is, however, somewhat less than the above figure, as farmers generally hesitate to give the exact yield.

Out of the total area of "ta", nearly 39 % can be dried up in the winter months and planted with other crops, such as barley, rapeseed, green manure, etc., thus securing two crops a year from the same ground. The remaining larger portion, 61 % of "ta" may be reckoned as wet the year round, and this might be turned with advantage into "1 Paddy Fields" by introducing a suitable system of drainage.

Next to rice in importance comes barley. This cereal is cultivated almost throughout Japan and is of two kinds, — the naked and the hulled varieties. The former has for its zone the whole of the southern part of Japan, while the latter is extensively cultivated in the rest of the Empire. Unlike in Europe, this cereal forms here a staple food of the people, especially among the agricultural portion; it is likewise used to feed horses and is made into malt, since beer brewing has of late become of considerable importance.

Other cereals such as wheat, millet, foxtail, Italian millet, barnyard and buckwheat are also raised. Maize is cultivated almost alone in mountainous districts and there it is a staple article of food.

Leguminous products such as peas, soy-beans, kidney-beans, and mung beans (*Phaseolus radiatus*) are among the important crops. Among other crops, sweet potatoes, *daikon* (a sort of radish), the taro root (colocasia) and potatoes are widely raised. Sweet potatoes thrive wonderfully in the southern provinces, while *daikon* is extensively cultivated in the northern part of the Country. The former is a regular article of diet in many producing provinces, and so is the latter in the cooler parts of the Country.

Cultivation of Industrial Plants.—“Intensive farming” naturally stimulates the cultivation of such industrial plants as assure a higher production than ordinary food crops. The areas so used are quite extensive and come up to 4.82 % of the total area under cultivation, which is greater than that in other countries similarly situated. Tea, which is grown principally on hilly districts as well as in ordinary fields, is an important article of commerce, and is universally used for making a national beverage.

Tobacco culture is not without importance; since the introduction of a state monopoly, the area devoted to it has decreased although the industry has not suffered any reduction.

Sugar cane is still cultivated in many places, but it has lost its former importance. So also has cotton in a greater degree, though efforts are made to grow it in some parts of the Empire.

Vegetable wax, which is obtained from the berries of the rhus tree, is produced in the warmer parts of the Country on land of little value. As to indigo, as may be supposed, the substitution of artificial indigo has considerably demoralised the market, and has reduced the area under cultivation.

Among textile plants, hemp retains its importance. Lately, the cultivation of rushes in the manufacture of matting is becoming a paying business, especially in the western part of the Country. The finished mat thus made is steadily finding an increasing market both at home and abroad.

Bamboo is produced for making into baskets, light portmanteaus, and is grown both on wet and dry land.

Among oleaginous crops, rape comes foremost in the list. The crop was once cultivated in upland fields, but in these days it is grown only on rice-fields as a second crop. Owing to the use of petroleum for the purpose of lighting, rape-seed oil has lost its old position of importance as an illuminant.

We have elsewhere referred to the fact that no forage crop of importance is produced. In place thereof, however, we have the leaves of the mulberry tree used in feeding silk-worms. Needless to say, there is not much chance where the cultivation of this valuable tree is possible in which silkworms are not raised.

Live Stock. — Among domestic animals, horses and cattle are by far the largest in number. They both do great services as beasts of burden and in agricultural operations. Cattle are, however, far smaller in number than in other countries. Cows are generally put to work in the fields.

As to the dairy industry, its importance is far behind that in European countries. A limited number of milk-men are found in the mountain districts only to furnish the city people with fresh milk. Cheese and butter are too little to be of any significance.

Many farmers who have been hitherto exclusively occupied in the cultivation of rice and other field crops are now turning their attention to the more profitable live stock. The fattening of domestic animals, which has been little practised so far in the Country, has been introduced in a few localities and promises a good future.

As referred to in the first part of this treatise, both horses and cattle are raised mostly in mountainous districts, where land is less valuable or where the cultivation of rice is hardly possible. Particular mention of horse raising is unnecessary here. Calves are generally sold before they are a year old; they are bought and reared for some time by farmers in the plains and they are resold. They often change hands three or four times before attaining their full maturity. Goats and swine are now being raised in many provinces.

The Poultry and Other Industries. — The poultry industry is coming into vogue among farmers as a secondary one, although still a large portion of eggs is imported from neighbouring countries, especially from China.

Fish are raised in many places. Carp, which are highly prized as an article of food, are successfully propagated in rice fields; while catfish are still covered with water in the early stages of rice cultivation, if there is sufficient water for young fish.

Sericulture, or cocoon culture, is carried on all over the Country and is a valuable resource of the people and the country at large. Most of the farmers reel their cocoons themselves, but most of the cocoon raisers sell their products to the middlemen who resell them to the filatures. The industry which is so lucrative from one point of view is not without its evils from another, for the profits are such that nowadays many farmers have formed luxurious habits which are most injurious to them. The production of bivoltine and trivoltine cocoons is increasing very fast, but the continued taking of them is liable to impoverish the soil. In many places the co-operative method of rearing worms has been adopted, the worms being cared for by the farmers until the third stage is reached when they are divided among the filatures.

Other Secondary Industries and By-Products. — Peasants are generally engaged in different sorts of minor industry, beside their work in the fields; some earn money by jobbing while others engage in various sorts of mechanics during their leisure time. Rice-straw is much used in many sorts of work and many find occupation in making ropes, sandals,

ing their leisure hours. The plaiting of barley straw into braid for manufacture of hats is done by the women and children of the rural population. These products command a good price both in the domestic and foreign markets. One reason why farmers in this country make abundant use of fertilisers is the utilisation of straw and the consequent exhaustion of the soil.

Weaving is still done by the women in some places; paper-making, reeling, the weaving of matting, plaiting of chip braids, basket work, wood working are other minor industries, in which the agricultural population find occupation for their leisure time. These industries should, of course, be studied and watched by parties interested in rural economy. Summing up what we have said, we conclude that the area under cultivation in this country, even in the densely populated parts, is comparatively smaller than in any other old country. This is due principally to the mountainous nature of the Country which reduces the arable

The minute division of the land hinders the use of efficient agricultural implements; and the little attention paid to the raising of domestic animals makes much of the hilly land of no use.

The greater part of the farmers who cultivate paddy fields only are provided with land enough to occupy their time when two crops are raised on the same rice field, as in the warmer portions of the Country. In busy time is limited to two periods of the year, and the cultivators have the rest of their time at their disposal. In those places where there are dry rice-land, or where dry fields predominate, the farmers have their time better occupied in their work than is the case with the cultivators of paddy fields only. The holders of dry upland fields must get their living partly by engaging in the cultivation of industrial plants or other special crops; for the cultivation of cereals alone, with the exception of rice, is not sufficient for the support of their families. Thus, we are disposed to believe that the best form of land holding for a farmer is a combination of wet and dry land in such degree, that his labour can be used to the best advantage. Peasants who have not sufficient land to work for themselves must naturally engage in day labour or must get their living by occupying themselves in minor industries. Along the sea coast or in lake districts, they engage in fishing; and in mountainous districts they engage in handicraft work.

Below we append data on principal crops with the acreage, including Hokkaido and the Loochoo Islands, for the year 1910 (1911*).

Crops	Acreage		Production	
	cho	acres		
Rice	2 949 439	7 226 126	46 633 376 <i>hols</i>	231 536 040 <i>hols</i>
Barley(*)	598 565	1 466 484	9 385 818	46 580 876
Naked barley(*)	667 234	1 634 723	7 505 811	37 250 589
Wheat(*)	499 204	1 223 050	5 009 840	24 863 335
Fortall millet	189 474	464 211	2 092 699	10 385 856
Barnyard millet	61 231	150 016	775 315	3 847 811
Maize	53 300	130 585	722 429	3 590 306
Buckwheat	156 591	383 648	1 311 575	6 509 216
Soy-bean	478 137	1 171 436	3 396 716	16 857 562
Red-bean	141 074	345 631	965 796	4 793 149
Sweet potatoes	283 207	718 357	832 877 987 <i>human</i>	6 871 243 393 <i>lbs.</i>
Potatoes	68 384	167 541	179 397 660	1 480 030 695
Radishes	104 681	256 468	657 489 683	5 424 289 685
Rape-seed	138 446	339 193	1 048 051	8 646 421
Tea(*)	50 213	123 022	8 151 413(*)	67 249 157
Tobacco	29 724	72 824	10 996 866	90 724 144
Mulberry	450 550	1 103 847		
Hemp	12 317	30 177	2 430 210	20 049 232
Rush for matting	3 704	9 075	8 839 906	72 929 224
Shititai (another kind of matting)	2 225	5 451	3 894 848	32 132 496

Live Stock

Number

Cattle	1 384 183
Horses	1 564 643
Pigs	279 101
Fowls	Mature 12 503 196
	Young 8 145 412

Cocoons (weight). 3 900 962 *human*. (45 382 893 *lbs.*)Green manure . . 380 537 cho (930 940 acres) 1 056 770 284 *human* (8 718 354 843 *lbs.*)

(*) Manufactured.

Recent Investigations at Rothamsted.

by

Dr. E. J. RUSSELL

Director of the Rothamsted Experiment Station, England.

For many years before their death, Lawes and Gilbert devoted their attention exclusively to crop production, and this policy has been adopted by their successors. Investigations at Rothamsted are now restricted to soil and plant nutrition problems, and no attempt is made to deal with such subjects as plant breeding, animal husbandry, etc., for which provision is made elsewhere. A further feature of Rothamsted is that it has local duties to perform; the Staff are not called upon to analyse fertilisers

ding stuffs, to advise, or to conduct demonstration plots of an educational nature.

The limiting factor in crop production in England is commonly the nitrogen supply; it very generally happens that an increased application of nitrogenous fertiliser leads to increased crop yields. For this reason many problems in this country often resolve themselves into questions of nitrogen supply, and such questions therefore claim a very large share of attention. Of course the other factors are borne in mind as well, but the centre to much of the work is the necessity for understanding more fully the nitrogen cycle in the soil with a view of ultimately controlling the processes that take place, reducing the losses and increasing the production of ammonia or of nitrates.

The second line of investigation has to do with the possibility of the stimulation of plant growth as apart from plant nutrition. Is it possible to find substances which are not themselves nutrients but which will stimulate a plant to greater activity in assimilating the nutrients from the soil or in those photosynthetic processes that enable it to utilise carbon dioxide of the atmosphere? This work is complicated by the difficulty of finding an exact definition for a nutrient on the one hand, and of eliminating secondary effects on the other.

Lastly, investigations are being started on the influence of soil conditions (manures, etc.) on the composition of the crop. In England considerations of quality of the crop play a very prominent part; the feeding value of root and hay crops, the malting quality of barley, the baking quality of wheat being all matters of importance in determining the prices. The ordinary analytical processes afford but little guidance to the farmer, and quality depends as a rule on some factors that have hitherto escaped our notice. As a first step in these investigations it has become necessary to ascertain more closely what substances are present in the crop and to determine how variations they are liable with change of conditions. This aspect of the work is being developed exhaustively, as it must form the basis of any rational elucidation of the rather vague characters summed up in the word quality.

It is much for the general outline of the recent Rothamsted work. We now turn to details of some of the investigations. Considerable attention has been paid to the conditions under which the production of food, and especially of ammonia and nitrates, goes on. It has been found that the process is mainly the work of bacteria, but that in normal conditions the bacteria are not working at their maximum efficiency. A factor has been discovered limiting the numbers of bacteria and therefore the rate of decomposition and its effect.

From the available evidence goes to show that this factor is biological: it is capable of growth, is put out of action by heat or antiseptics and can be set up again by infection from outside: it does not, however, appear to consist of bacteria, and is provisionally identified with the protozoa, of which numbers have been found in all the soils examined. Partially sterilised soils from which the factor has been extinguished are found to con-

tain larger numbers of bacteria than untreated soils and to accumulate monia and nitrates at a greater rate : they are, as might be expected, productive. Methods are being worked out for applying this kind of treatment on the large scale, but instead of setting up a large number of field plots to discover some cheap and convenient process, the simple alternative is adopted of inducing horticulturists who go in for indoor culture to adopt some of the methods known to work. This has proved very satisfactory and has led to a considerable cheapening of the method besides revealing some of the difficulties attendant on its application on a large scale.

The laboratory investigations are proceeding on two lines. A number of obscure soil problems are being examined and cleared up in the light of this new conception of the existence of two opposing sets of organisms. For example, changes in soil temperature are known to have but a small effect on the numbers of bacteria ; this has been traced to the presence of the detrimental organisms, for in partially sterilised soils from which they are absent the bacterial numbers show the normal change with change of temperature. "Sickness" in greenhouse soils and in sewage soils has afforded some interesting studies which have demonstrated that the detrimental organisms are an important factor in bringing it about. In fact it seems to be a general rule that conditions favourable to active life in soil may become unfavourable to productiveness through encouraging a detrimental organism, while conditions temporarily unfavourable to a life may be beneficial to productiveness through destroying them.

Further light has been thrown on the action of lime on the soil. It has been shown that dressings of lime sufficiently heavy to kill produce a marked increase in bacterial numbers and in the rate of production of plant food, the phenomena being entirely similar to those produced by other methods of partial sterilisation.

This new conception is proving very useful in clearing up old difficulties. A zoological survey of the soil fauna is being made by Mr. Goode and as the organisms are picked out they are studied to see whether they are likely that they could lead a trophic life in the soil or whether they are only as cysts. A large number of organisms are being found and the work is evidently going to take considerable time, but it will we hope lead ultimately to the actual identification of the detrimental organisms.

The problem of nitrogen fixation is also under investigation. The land at Rothamsted is left in grass, or allowed to cover itself with vegetation, its percentage of nitrogen rapidly increases. How much is due to symbiotic fixation and how much to the free living *Azotobacter* is not easy to decide, but Dr. Hutchinson has shown that, under the conditions actually obtaining, *Azotobacter* can fix considerable quantities of nitrogen. The percentage of nitrogen present in a mixture of sawdust and crop residues increased when cultures of *azotobacter* and cellulose-decomposing organisms were added, but not otherwise. Growing plants are able to utilise the nitrogen thus fixed. Again, when sugar was added to some of the nitrogen-starved barley plots, an increased crop was obtained.

to that which a dressing of nitrogenous manure would have given, results however, was only obtained when the sugar was added in the autumn weather; in cold spring the sugar had a deleterious effect. The gains and losses of nitrogen compounds by rain and drainage water, long been under investigation at Rothamsted. Analyses made on systematic plan by Dr. Miller have shown the low amount of nitrogen found in rain collected at out-lying lighthouses, and the uniform and that higher amount contained in rain collected in country districts. There is, however, a larger quantity is present. About 4 lbs. of nitrogen are thus brought down each year to the soil. The losses by drainage are much more serious. Lysimeter experiments continued over a period of years and still going on, have shown that about 50 lbs. per acre of nitrogen compounds, chiefly nitrates, were lost each year in the drainage for the earlier part of the period, and about 35 lbs. later on. The plots are kept without crop or manure, and are uncultivated except far as is necessary to remove weeds. When last the percentage of nitrogen in the soil was determined, the loss of nitrogen was found to be practically equal within the error of experiment to the amount of nitrogen recovered in the drainage water. Under these conditions, there is the essential change in nitrogen compounds appears to be confined to ammonia production and nitrification. But on the cropped plots where quantities of manure are added other losses appear to go on, which are now under investigation.

We now pass on to the plant work. The amount of growth a plant gives in a given soil is known to depend on the amount of food supplied, and this relationship forms the basis of the connection between the plant nutrition work and the soil work. But a hypothesis is current, and is supported by sufficient circumstantial evidence to make it worthy of consideration, that inorganic plant poisons act as stimulants to growth if supplied in sufficiently small quantities. If this hypothesis were well founded it would introduce a wholly new set of factors into plant nutrition relations, and would, in addition, form a basis for important practical developments. Very careful water cultures have therefore been made by Miss E. Brenchley to test this hypothesis as completely as possible. Compounds tested have been copper sulphate, manganese sulphate, sodium arsenite, arsenious acid and boric acid, and a wide range of concentrations has been adopted. Numerous plants have been tested, but on the whole barley and peas have proved most satisfactory. Copper sulphate was invariably toxic even in such high dilutions as 1 part to ten million of water. The effect varied, however, with the plant tested, and was somewhat masked in presence of nutrient salts. It is not entirely clear. The fact that boric acid decidedly increased the growth of peas, however that of barley, raises the interesting question whether boron is in any way advantageous to the pea and therefore to be regarded as a stimulant. Some specific effect is clearly indicated and the hypothesis is not to hold in its general form.

Starting from the other end, *i. e.* from the soil, an attempt has been made to ascertain whether any toxins are thrown off from the roots of plants that will adversely affect succeeding crops. A hypothesis to this effect has long been current, and has been defended by the United States Bureau of Soils. Plants have therefore been grown in succession in the same soil, year after year, and their yields have been compared with those obtained when a rotation was adopted. The results were entirely negative and no systematic difference could be observed: we are forced to conclude that if any toxic property is developed in soil by the growth of a crop, the effect is transient and does not persist long enough to affect a subsequent crop. So far our attempts to find toxins in the soil have resulted in failure.

An important piece of ecological work has been carried out by Dr. B. Chley, in tracing the relationship between the weeds of arable land and the soil and the crop. A definite association was found to exist between weeds and the soil, the determining factor being, however, the texture of the soil rather than its geological origin, excepting only in the case of chalk soils. The association was sometimes so close that it extended over a wide area; thus *Euphorbia exigua* and *Ranunculus arvensis* were always seen on heavy loams or clays. Sometimes, however, the association was affected by climatic or other factors: thus *Matricaria inodora* was common on clay in Bedfordshire but absent near Bath. The two cases are distinguished as General and Local Association. Very few plants, however, could be said to be symptomatic of soil conditions in the sense of being restricted to any one type of soil; but a good many plants are characteristic, *i. e.* are more frequently found associated with one soil than with another. *Rumex acetosella*, *Spergula arvensis* and *Scleranthus annuus* may be regarded as symptomatic of soils giving no carbonate reaction with dilute hydrochloric acid. A relationship also exists between the weeds and the crop: *Plantago lanceolata* and various species of *Geranium* are common in temporary grasses ("seeds" crops), while *Poa annua*, *Polygonum aviculare* and *P. convolvulus* are very rare. No doubt the conditions of cultivation account for this. It is surprising how many of the weeds belong to the *Compositae*, at least half the genera of this order proving species of weeds; on the other hand *Rosaceae* and *Leguminosae* supply very few weeds.

The larger problem has been investigated of tracing the relationship between the system of agriculture practised and the soil types as characterised by mechanical and chemical analysis. The South Eastern part of England was selected as the area of examination, and various correlations were traced between the analytical data and the properties of the soils. Consideration of these, however, is best deferred until the completion of similar surveys which are being undertaken in other parts of the country.

The third division of the work, dealing with the composition of crops, has only recently been undertaken. Mr. Davis has begun with the sugar beet and has made a careful survey of the methods in use for estimating the sugar in plant products. The analytical difficulties are very considerable, and

ected sources of error have been revealed in some of the methods

In particular the necessity for using basic lead acetate in relatively large proportions for the purpose of eliminating amino-acids, etc., and the subsequent removal of the lead by sodium carbonate, give rise to difficulties in estimating cane sugar because the sodium acetate thus formed protects it from inversion by weak acids. Objection can only be raised against other methods; but the progress that has been made up to the present fully justifies the hope that a satisfactory solution will be found of the various difficulties encountered.

In conclusion, it may be stated that no bulletins are issued from Rothamsted. The scientific papers dealing with Soil Fertility in any of its chemical or bacteriological, are published in the *Journal of Agricultural Science*: those dealing with the botanical side are published in the *Annals of Botany*. Papers intended for farmers are published in the *Journal of the Board of Agriculture*.

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The Present Organization of the Meteorological Service in Italy.

by

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In Italy the Meteorological Service is directed by the Royal Central Meteorological and Seismological Office in Rome, which depends from the Ministry of Agriculture, Industry and Commerce.

In a paper under the title of "Meteorology and Seismology", which is one of the monographs collected in the work published under the auspices of the Government and of the R. Accademia dei Lincei on the fiftieth anniversary of the proclamation of the Kingdom of Italy, I had occasion to draw up the history of the Meteorological Service in Italy from its inception, through its successive stages of development to its present form. In this paper I shall not refer to the past, but I will limit myself briefly to the actual state of the organization of our service.

State network of meteorological observatories. — The Government network consists of observatories, of temperature and rainfall stations and of simple rainfall stations. In the observatories observations are made of all the principal elements of climate: barometric pressure, temperature and moisture of the air, direction and velocity of the wind, cloudiness, cloud forms, and rainfall. The most important observatories possess, besides the usual non-recording instruments, the various apparatus that register pressure, temperature, hygrometric conditions (generally self-registering instruments of the Richard type are adopted), rainfall (Richard or Palazzo type), hours of sunshine (Campbell Stokes heliograph), wind (anemometers registering by mechanical or electrical means, Brassart's types). The temperature and rainfall stations are provided only with rain-gages and maximum and minimum thermometers; they record also the direction and estimated force of the wind and the state of the sky. Lastly, the rainfall stations limit themselves to observations on the fall of rain and of snow.

Many of the observatories are attached to higher or medium educational institutions, among which we include university astronomical observatories, which carry out as a rule also ordinary meteorological observations; but the greatest number of the stations are conducted by private persons, schoolmasters, municipal secretaries, parish priests, and

(1) *Cinquanta anni di storia italiana (1860-1910)*. Tip. della R. Acc. dei L. Roma 1911.

ers of estates, etc. The practical schools of agriculture also, but of them, have meteorological observatories, and the semaphores Royal Navy and the port captains' offices also forward meteorological data to the Central Office.

The above-mentioned university observatories and the five Royal Meteorological Observatories: Rocca di Papa, Ischia, Catania, Pavia and Salò, supported by the State, as well as the mountain observatories on Rosa, at Sestola-Cimone and at Tiriolo (Catanzaro), but beyond these there are in Italy no other exclusively meteorological observatories, directly and entirely supported by the Government. A few of the observatories of the network are in receipt of subsidies from the States or Provinces; but on the whole it may be said that the work of our meteorological stations is performed gratuitously, inasmuch as the Government grants only small subsidies as compensation or for the upkeep of the observatories and which in no case can be considered as salaries for the persons entrusted with the observations.

In almost all the capitals of the provinces there is a principal observatory, the director of which has the high surveillance over the temperature and rainfall stations which form the provincial network.

According to a list drawn up on January 1, 1913, there are in Italy 314 meteorological observatories, 314 temperature and rainfall stations and 112 simple stations; these latter are established by the provincial offices of the State Civil Engineers and by improvement contractors and associations. Considering also about 30 stations belonging to agricultural, port authorities and semaphores, which register rainfall readings, the total number of rain-gages in Italy is at present 630.

For the most part observatories and stations have been founded on private initiative, it was not to be expected that the distribution of stations would be very uniform; indeed, while in several districts, in the valley of the Po and the Salentine peninsula the stations are close to each other and sometimes more numerous than necessary, in other regions they are scarce. This, for instance, is the case in the districts of Grosseto, in Calabria and in Sardinia. It would be especially desirable to have a greater number of stations for the record of rainfall, particularly in the mountainous parts of the country, which would be so valuable for the study of the rivers and for the utilization of water.

The Central Administration intends, as soon as the means at its disposal allow it, to increase by about five hundred the number of rain-gages, distributing them in those districts where they are least numerous.

The regulation hours for ordinary meteorological observations for our network of observatories are 9 a.m., 3 p.m. and 9 p.m.; besides which the observatories that have to send off telegrams in the morning for other forecasts, make their observations at 7 a.m. A few observatories and some semaphores take a supplementary observation at 11 a.m. and forward it by telegram to the Central Office.

The three observations of every day are written on special forms and are sent to the Central Office every ten days; while the temperature and rainfall stations use monthly forms, that is they are sent at the end of every month. Similarly on the last day of each month the Offices of the State Civil Engineers send the Central Meteorological Office a copy of their rainfall readings.

Distribution of the duties in the Central Meteorological Office; Section Climatology. — The Central Office, besides the Secretary's Office which attends exclusively to correspondence and to administrative affairs, divided its work into five sections: Climatology, forecasts, agriculture and storms, physics, seismology. Every section is directed by a meteorologist, a doctor in physical science, assisted by some technical officials or compilers, who are eight in number, all told; in truth they are too few and quite insufficient to meet requirements.

The duties of the climatological section consist in working up the data collected by all the observatories and meteorological stations in Italy, calculating the averages for the ten days, month and year, tabulating observations and publishing them in the *Annali dell'Ufficio centrale meteorologico e geodinamico*, of which more hereafter. The head of the section devotes himself especially to climatological studies and prepares monographs on the various elements of the climate of our country.

Telegraphic meteorological and weather forecast service. — The section called weather forecast draws up the daily telegram on the state of the weather and on its forecast, and attends to the preparation of the *Meteorological Bulletin* which is issued every day on lithographic sheets.

For this purpose the section receives the telegrams which form the observations made expressly for it at 7 a. m. in 73 Italian observatories, besides similar observations of 54 foreign observatories. From these data the isobar and isotherm charts which serve as a base for the weather forecast are drawn up.

The Daily Meteorological Bulletin is published as a four-page lithographed sheet, illustrated by three maps: one shows the isobars at 7 o'clock in the morning on Italy and on the neighbouring Mediterranean countries (the east of Spain, France, Switzerland, Austria, the Balkan peninsula, Algeria and Tunis) with graphical indications on the state of the sky and the sea, the rain, wind and storms; another one gives the isotherms at 7 a.m., also of the Mediterranean, with an account of the phenomena of the preceding 24 hours; and lastly another map on a smaller scale shows the isobars over the whole of Europe. In the first pages of the sheet the meteorological information from the Italian observatories is given, grouped according to regions, and showing each: the barometric pressure reduced to 0° C. and to sea level, the difference from the readings of the previous day; the temperature and its difference from that of the preceding bulletin; the direction and strength of the wind, the state of the sky; the direction of the clouds, the state of the sea at the maritime stations; the maxi-

minimum temperatures of the preceding 24 hours; the amount, in metres, of the rain or snow fallen in the same time; lastly, various observations referring to special events, such as storms, gales, rain, snow, etc., with indications as to the time of day in which the above place. The fourth page contains the above-mentioned small isobar of Europe, the text of the meteorological telegram and a table of meteorological data in the various States of Europe; as well as those of Algeria, Tunis, Malta, Alexandria and Tripoli.

The meteorological telegram is drawn up about one o'clock in the afternoon and a copy of it is sent to the Central Telegraph Office for transmission to the capitals of the provinces, to the semaphores and to port captains' offices. In this telegram a notice is given of the position of the barometric maxima and minima over Europe; it contains a summary of the weather in Italy during the preceding 24 hours, the meteorological conditions of the morning in Italy, the distribution of pressures and lastly the weather forecast. This forecast is added generally for the next 24 hours. When storms at sea are expected, telegrams are sent as soon as possible to the semaphores and in order that the storm signals agreed upon by maritime convention may be hoisted along the threatened shores.

The bulletin is lithographed and appears before the evening; it is sent by post to the Italian observatories, to many Government offices and public administrations free of charge; it is also sent in exchange to foreign meteorological institutions. There are also private subscribers to the Bulletin, who pay 16 Lire (12s. 8d.) per annum in Italy and 23s. 9d. abroad.

Extracts from our bulletin are published in the *Gazzetta ufficiale del Regno*, as well as in the chief newspapers, often together with a table containing the data collected at the Royal Astronomical Observatory of the Collegio Romano.

Lastly the telegraphic and weather forecast section of our Office belongs to the international service consisting in forwarding telegraphic information from Italy the meteorological data of a certain number of Italian observatories, selected for the purpose, to the following foreign central meteorological offices and observatories: Paris, St. Petersburg, Trieste, Vienna, Hamburg, Athens, Madrid, Pola, Budapest, Sofia and Malta.

Agricultural and thunderstorm service; Meteorico-agricultural Review.—This section of the Office has the duty of collecting, ordering and working up the information concerning the thunderstorms which break out in Italy. This information reaches the Office by special uniform forms filled on cards which are filled in by the directors of the observatories and of the temperature and rainfall stations of the Government and by other willing correspondents. On the basis of the observations thus collected the head of the section studies and draws up statistics concerning thunderstorms and hail in Italy, their distribution according to localities and seasons, their connection with the other elements of climate, etc. Besides which the present chief of the section is

engaged on various kinds of research work connected with atmospheric electricity.

The same section attends also to the agricultural service, which consists in collecting and making extracts from special cards which are sent in by most observatories every ten days with brief news on extreme temperatures, the cloudiness of the sky, the rainfall, with the addition of special information on the state of the fields, on the various crops and on the general progress of farming operations. With the aid of this intelligence the *Meteorologico-agricultural Review*, which is published every ten days, is compiled. The Review includes a summary of the pressure in Europe and of the meteorology of each of the ten days of Italy; a recapitulation of the agricultural news for each of the regions of Italy, followed by another short summary for the whole of Italy; and lastly the detailed information which reaches the Office by means of the cards of the various observatories, grouped according to regions and provinces. In the review a small map showing the true isotherms and the distribution of rain in Italy during the ten-day period is also published. Sometimes, as an appendix, brief meteorological notes written by various authors are added.

Physical service; magnetic chart of Italy. — The physical section of the Office deals with the examination and testing of the different meteorological apparatus which have to be sent to the observatories. This section has for this purpose a small physical laboratory, provided with the necessary instruments for measuring, and especially for testing the thermometers, barometers and aneroid barometers. Besides which the section carries out research work on the physics of the atmosphere and on the earth.

In describing the distribution of the various branches of the Central Office the *seismological section* was mentioned. As its name implies it deals with the study of earthquakes in Italy and with the publication of intelligence respecting them. But we cannot enter more fully into this subject, as for the special nature of the periodical in which this paper appears the latter must limit itself to the subject of the organization of the meteorological service.

Publications of the Royal Central Office. — In the foregoing we have mentioned the official publications of our meteorological service, namely the daily *Meteorological Bulletin*, the *Meteorologico-agricultural Review* which is issued every ten days, and the *Annals*. We will add a few words on the latter, which are the most important organ of publication of the Central Office.

In general, every volume of the *Annals*, corresponding to one year, is divided into three parts. The first part contains papers and original works by the scientific staff attached to the Office, and by other Italian meteorologists and students of physics of the earth. The second part is devoted to the publication of meteorological data collected by all Italian observatories and worked up by the climatological service of the Office, as has already been stated. The third part contains similar

ta furnished by the temperature and rainfall and by the rainfall is. Thus the second and third parts considered together form a collection of meteorological data which can be used as a foundation for any study on the climate of Italy; while the first parts have several important publications of a synthetic character on elements of our climate, such as rainfall and temperature; papers on other factors are being prepared. We attach special importance to these researches on the climate, inasmuch as they represent that part of the meteorological State service which has more directly practical ends and which admits of immediate application to social economics, hygiene and to agriculture.

In this connection it may be mentioned that the General Direction of Statistics publishes every two or three years in the *Annuario Statistico* a series of tables showing the averages, for a certain number of Italian cities, of the climatic factors, drawn from the observations of several years, for which work the material collected by our Office is of great use.

Managing Board of the Meteorological and Seismological Service. — In order to complete the information on the organization of the Meteorological Service in Italy, the managing board has to be mentioned. It is the highest authority which superintends the whole of the service; it draws up resolutions, advises on the general measures to be taken, decides on the installation of new observatories, etc. All the more important questions, and those which entail greater responsibility in matters of administration and estimates, are submitted to this Board, which usually holds its session, which lasts several days, once a year. The Director of the Office reports to it upon his management. The Board is composed of six members besides the director; two of them represent the Ministry of Agriculture and one each the Ministries of Public Instruction, Marine, Public Works, and Posts and Telegraphs, which are most interested in the meteorological service.

Italian Meteorological Society. — In Italy there exists, as in other countries, a Meteorological Society, which stimulates meteorological study, awakens interest in it and promotes the institution of new stations; its organ is the *Bollettino Bimensuale*, in which short papers, and meteorological intelligence and data appear. The Society's network cannot be considered as distinct from that of the State, as owing to the excellent relations existing between the President of the Society, Count Antonio Adella Vigodarzere, and the Director of the Royal Central Office of Meteorology, the stations which have been founded by the Society lend their services in the general interest and send copies of their data to the Royal Office.

Manuring of Sugar Beets. Present State of the Question in Germany.

by

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In Germany the only breeds of beets that are grown are those of Klein-Wanzleben origin, as this variety has proved superior to all others.

Among the crops raised in Germany, the sugar beet is the one which gives the heaviest yields on the better class of soils. Thus where under the most favourable conditions with wheat and potatoes about 80 cwt. of dry matter are produced per acre, a sugar beet crop, under the same conditions, yields from 128 to 135 cwt. of dry matter per acre, except even a crop of mangels. It is therefore evident that sugar beets require especially large quantities of plant food for their development, and the greater part of this plant food is derived, under normal conditions, from the soil, the lesser from the manures.

Farmyard manure.—Like all root crops, beets are especially responsive to farmyard manure, by means of which notable increases of yield are obtained. Thus at the Lauchstädt experiment farm the following increases per acre were obtained as average of several years (1):

	Roots cwt.	Sugar cwt.	Leaves cwt.
With 12 tons farmyard manure	84.4	14.6	120.1
" 8 tons " "	71.2	12.9	81.3

Further, the yearly experiments at Lauchstädt show that the best yields of sugar beets can not be obtained without farmyard manure. The yearly averages were (2):

Cwt. per acre			
	Roots	Sugar	Leaves
4.0 cwt. nitrate	348.6	60.26	232.35
0.8 cwt. phosphoric acid			
8.0 cwt. kainit			
4.0 cwt. nitrate	425.0	70.18	292.01
0.8 cwt. phosphoric acid			
8.0 cwt. kainit			
and stall-plt manure	400.7	68.20	292.25
4.0 cwt. nitrate			
0.8 cwt. phosphoric acid			
8.0 cwt. kainit	400.7	68.20	292.25
and farmyard manure			

(1) VII. Report of the Experiment Farm at Lauchstädt, p. 41. *Landesbäcker*, 1910. (Author's note)

(2) IV. Report of the Experiment Farm at Lauchstädt: 1902, pp. 18-19. *Landesbäcker*, 1902. (Author's note)

from this it is seen that the heaviest crops cannot be obtained from manure alone, even when given in maximum dressings. With these, a maximum crop was 349 cwt. per acre, while with the addition of farm-manure 400 and 425 cwt. per acre were reached.

Considering the exceedingly favourable effect of farmyard manure on sugar beets, the farmer should use his available stock of this fertiliser as much as possible for beets. The most favourable quantity to be given can be set down at 8 to 12 tons at most per acre.

Green manuring.—To this form of manuring also sugar beets are very responsive, so that it is advantageous when circumstances allow it to grow sugar beets on green manure. At Lauchstädt the average of 11 years shows the increase of crop due to green manuring to be 1.7 cwt. of beets with 7.61 cwt. of sugar per acre(1).

The percentage of sugar was not perceptibly diminished by the green manure. If stable manure is given together with the green manure there must not be applied too abundantly or a great waste of nitrogen may ensue, and the excess of manure would cause a greater diminution in the sugar content percentage.

Artificial manures.—a) *Nitrogenous manures.*—Among these the most important are nitrate of soda, sulphate of ammonia and the commercial is obtained by electro-chemical processes, namely Norwegian nitrate of soda and calcium cyanamide. Sugar beets utilize best of all the above, the action of which, under normal conditions, is not equalled by any other form of nitrogen, or even by sulphate of ammonia. The nitrate should be used only when a very heavy nitrogenous dressing is required, which in the form of nitrate is likely to promote caking of the surface of the soil. In this case a combination of manures is advisable, namely, one half of the nitrogen as a mixture of sulphate of ammonia and superphosphate ("ammoniaksuperphosphat") in preparing the land and the other half in the form of nitrate as top-dressing. Instead of nitrate of soda the Norwegian nitrate of lime may be used, as many experiments(2) prove that it may be considered to be equal in value to nitrate of soda. Calcium cyanamide is not so advisable for sugar beets, at least on light soils(3). If, on account of its lower price, it is to be used on better soils it should be applied with nitrate.

As for the amount of nitrogen to be given, the following may be considered as normal quantities:

Without farmyard manure	3.2 to 4.0 cwt. nitrate
With farmyard manure or green manure	1.6 to 2.4 cwt. nitrate

V. Report of the Experiment Farm at Lauchstädt: 1904, p. 34. *Landw. Jahrb.* 1904.

(Author's note).

Arbeiten der Deutschen Landwirtschafts-Gesellschaft, Parts 146 and 217.

(Author's note).

Ibid.

(Author's note).

In the first case, if caking of the surface is to be feared, a part of nitrate should be replaced by sulphate of ammonia (ammoniacal phosphate).

It is well known that it is not advantageous to give heavy doses of nitrate all at once when the seed is sown, but that it is preferable to divide the quantity in several portions, the last of which is generally not later than June 20, and on light soils at the beginning of June.

b) *Phosphatic manures*. — Beets show a decided preference for the water-soluble phosphoric acid contained in superphosphates as compared with the less soluble phosphoric acid of basic slag. They especially require during the earliest stages of growth a certain quantity of easily assimilable phosphoric acid, so that superphosphates are at the best form to be used in the better kind of soils, and also on light soils it is advisable to give a portion of the phosphoric acid under the assimilable form of superphosphates.

The amount of phosphoric acid to be given, independently of the nature of the soil, depends chiefly upon the amount of farmyard manure that is used. The local farmyard manure contains an average of 0.4 per cent. of phosphoric acid, so that a dressing of 8 tons per acre contains about 72 lbs. of phosphoric acid, which, as the Lauchstädt experiments show, has a most favourable effect, especially when the manure is the result of rich food. Anyhow, and this is proved by other experiments, the amount of phosphoric acid to be given may be considerably reduced if farmyard manure is used at the same time (r). The following may be considered normal quantities per acre :

Without farmyard manure	3.2 to 4 cwt.
With " "	1.6 to 2.4 cwt.

c) *Potash salts*. — Sugar beets, like mangels and potatoes, are typical potash plants, but owing to their highly developed root system they possess to a greater degree than mangels and much more than potatoes the power of taking up potash from the soil. For this reason potash manures do not cause such high increases of yield with the beet as they do with mangels or potatoes.

The amount of potash manures to be given depends, as in the case of phosphatic manures, chiefly upon the quantities of farmyard manure used. The latter contains an average of 0.7 per cent. of potash, so that with a dressing of 8 tons per acre, 125 lbs. of potash are given, as much as is contained in 8.76 cwt. of kainit. Consequently, medium and heavy farmyard manure dressings are given to the best kinds of land, a special application of potash is often not necessary, while on light soils an addition of potash would not be out of place.

Among the Stassfurt potash salts those most frequently used are sylvinite and "Hartsalz" (the two latter generally going also by the name of kainit) and the 40 per cent. potash salt. The amount of salt contained in 1 cwt. of 40 per cent. potash salt is the same as $3\frac{1}{4}$ cwt. of kainit. For plants which, like beets, respond to the salts contained in kainit, 2 cwt. of kainit may be considered equivalent to 1 cwt. of the 40 per cent. potash salt. The following quantities may be recommended:

Without farmyard manure, 4.8 to 6.4 cwt. of kainit or 2.4 cwt. of 40 per cent. potash salt; with farmyard manure, 0 to 4.8 cwt. kainit or 0.6 cwt. of 40 per cent. potash salt.

In applying this, the autumn is preferable to the spring, and on other kinds of soils 40 per cent. potash salt is to be chosen.

The use of phonolite is to be strongly deprecated.

Influence of manuring on the quality of the beets. Influence of nitrogenous manures.—Every application of nitrogenous manures causes a decrease in the percentage of sugar. But with the improved kinds of beets which we grow now this decrease is not so considerable to cause nitrogenous manures to be feared. The average diminution of sugar content observed during a long series of years was as follows: (1).

With green manuring	— 0.20	per cent. of the beet
" farm yard manure, 16 tons per acre	— 0.39	" "
" stall-pit manure, 16 tons per acre	— 0.57	" "
" nitrate of soda, 4 cwt. per acre	— 0.50	" "

Thus, even with these heavy dressings the decrease in the percentage of sugar was not considerable.

In numerous experiments on beets carried out in the province of Pomerania on various kinds of soil, in which 1.6 to 3.2 cwt. of nitrate per acre and other nitrogenous manures containing corresponding quantities of nitrogen were used, no depression in the sugar content was observed: (2):

Without nitrogen	17.1	per cent. of sugar in the beet
With nitrate of soda	17.2	" " "
With sulphate of ammonia	17.3	" " "
With cyanamide	17.3	" " "

It is thus ascertained that our recent resistant beet varieties can tolerate relatively high quantities of nitrogen without any consequent diminution of sugar worth mentioning.

Top dressings can also be carried out without hesitation provided they are applied not later than the 20th of June. The average sugar content observed during several years was the following (3):

¹ II. Report of the Experiment Farm at Lauchstädt: 1907, p. 26. *Landw. Jahrb.* 1907. (Author's note).
Arbeiten der deutschen Landw.-Gesellschaft, Part 146, p. 115. (Author's note).
Loc. cit., p. 113. (Author's note).

	3.5 cwt. nitrate per acre (the whole given at seeding time)	3.5 cwt. nitrate per acre (1.6 cwt. at seeding and 1.6 cwt. as top-dressing up to June 20)
Sandy soil	17.25	17.15
Sandy loam	16.10	16.25
Loam	18.15	18.05
Clay loam	17.25	17.20
Average	17.19	17.21

Consequently the practice of dividing large applications of nitrate of soda, where it seems advantageous, can be safely recommended, keeping in mind, however, that in general the last application must not be later than June 20. On light soils, where the beet closes its period of growth earlier, the top-dressings must be given betimes.

Influence of phosphatic manuring. — It is still believed by many that phosphoric acid increases the sugar content of beets; but in reality under normal conditions, this is not the case, as is proved beyond doubt by the following:

1. The accurate experiments of Hellriegel, which demonstrate that the lack of phosphoric acid diminished the amount of the beet but never the percentage of sugar in the beets.

2. Numerous field experiments.

Thus, for instance, at Lauchstädt the percentage of sugar was as follows:

	Percentage of sugar in the beets
Average of 11 years without phosphoric acid	17.60
Average of 11 years with phosphoric acid	17.58

When the beets were not harvested too early, those manured with phosphoric acid never showed a higher sugar content than those without phosphatic manures. Matters are somewhat different when the harvest is very early and on soils under less favourable climatic conditions where the beets mature too slowly.

Influence of potash manures. — With the old varieties of beets, potash manures always produced a depression in the sugar content, with the new improved sorts, the contrary is the case, as numerous experiments testify (1).

The ash content of the new improved beets is not sensibly increased by heavy manuring. Thus the average ash content obtained from numerous experiments at Lauchstädt was the following:

(1) *Arbeiten der Deutschen Landwirtschafts-Gesellschaft*, Parts 56, 67, 81 and 193.
(Author's note)

Manure per acre	Percentage of pure ash in dry matter
Without manure	1.89
4.8 cwt. nitrate, 0.8 cwt. phosphoric acid, farmyard manure	2.07
12 tons farmyard manure	1.98
12 tons farmyard manure, 3.2 cwt. nitrate, 0.8 cwt. phosphoric acid, 1 cwt. potash	2.39

certain increase of ash due to the manure cannot be denied, but small that it does not cause any great difficulty in working up in the factories, especially as such heavy manuring as that given above experiments is rarely resorted to in practice. According to investigations the dry matter of the new beet varieties contains about 2 per cent. of pure ash, while up to the year 1880 the average age of ash in the dry matter of sugar beets was 3.84(1), or nearly as much as that contained in the new improved varieties. This is proved by the fact that for the production of our new varieties the richest in sugar have always been selected and such beets have possessed a low ash content. Thus, without its being known, the ash content has been inherited together with a high sugar content. Recent improved beets do not take less plant food from the soil than the old ones did; on the contrary, they take up quite as much plant food, but store it up much less in the roots than in their developed leaves.

Lenz and von Lengerkes *Landw. Kalender*, Paul Parey. Berlin.

(Author's note).

SECOND PART.
ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

202 - **Government Crop Reports: Their Value, Scope and Preparation**
*U. S. Department of Agriculture, Bureau of Statistics, Circular 17. Washington
November 1911.*

The collection of agricultural statistics in the United States was authorized by an Act passed May 15, 1862. In the following year a part of the appropriation for the Department of Agriculture was allotted for the work of collecting agricultural statistics; in 1865 \$ 20 000 (£4113) appropriated for this object. Since then the crop reporting service has been perfected and enlarged into the Bureau of Statistics; in the fiscal year 1912 the appropriations for this Bureau amounted to \$ 232 000 (£47 721).

The data upon which the reports relating to agricultural conditions are based are obtained from State statistical agents and from volunteer correspondents.

Among the former there are 20 travelling agents, especially qualified by statistical training and practical knowledge of crops. They systematically travel over the districts assigned to them and note the development of each crop, keep in touch with best informed opinion and send written and telegraphic reports monthly. There are besides 47 State statistical agents located in different States. Each receives the reports of correspondents in the different parts of the State, which he then coordinates and analyses in the light of his personal knowledge of conditions and prepares his report for his State to the department.

Independently of the above, there is, in each of the 2800 counties of agricultural importance in the United States, a principal county correspondent, who, with the aid of several assistants, prepares the reports for the county which he sends direct to Washington.

Further, the department receives reports direct from about 300 township correspondents located in the townships in which farming operations are extensively carried on.

ally a large number of individual farmers and planters report on ults of their own individual farming operations during the year; e data are also secured from 30 000 mills and elevators. th regard to cotton, the information from the foregoing sources is xented by that furnished by special cotton correspondents, and in enquiries in relation to acreage and yield per acre of cotton are ad to the cotton ginner on the list of the Census Bureau. om the time of planting up to that of harvesting, data are gathered orts made as to the condition of each of the principal agricultural s; a normal condition of 100 is that of the plant where it romise of a good average crop provided it is not subjected aging influences. Condition reports, expressed in percentages ormal, are coupled with a statement of the averages (usually r averages) of similar reports at corresponding dates. At harvest time ds per acre are ascertained; these being multiplied by the acreage already ascertained give the production figures for the year. Fur- : causes of injury to the crops, the estimation of the value of the crops, ket prices, etc., are also frequently given. : several employés send their reports separately and independently lepartment at Washington.

order to prevent any possible access to reports which relate to spe- crops, all of the reports from the State statistical agents as well : from the special field agents are sent to the Secretary of Agricul- specially prepared envelopes, which are delivered in sealed mail pou- these pouches are opened only by the Secretary or Assistant Secre- d the reports with seals unbroken are kept in a safe in the Secretary's til the day when they are delivered to the statistician. The com- for opening the safe is known only to the Secretary and the Assis- secretary of Agriculture. Reports from special field agents and State al agents residing at points more than 500 miles from Washington : by telegraph in cipher. The reports from the county and township ndents and other voluntary agents are sent to the chief of the Bu- statistics by mail in sealed envelopes.

board composed of five members, which are changed every month, p the final crop estimates from the reports and telegrams sent in, State separately and for the whole of the United States. This board n the office of the statistician; they open the reports which till ve been kept sealed; each individual member computes independent- own estimate in a general report for each State. These reports are pared and discussed and the final figures are decided upon. ports in relation to cotton are issued on the first or second day of nth, and reports relating to the principal farm crops and live stock on nth or eighth day of each month.

order that these reports may be made available simultaneously out the entire United States they are handed at the same time on days to all applicants and to the Western Union Telegraph Co. and tal Telegraph Cable Co., who have branch offices in the Department

of Agriculture and who reserve their lines at the designated time for submission to the exchanges and to the press. The same day cards contain the essential facts concerning the most important crops are mailed to 77 000 post offices throughout the United States for public display.

Promptly after the issuing of the report, it is published in the Reporter. An edition of over 165 000 copies is distributed throughout the whole country.

203 - Agricultural Possibilities of Benadir, Italian Somaliland.

ONOR, ROMOLO. Appunti di agricoltura benadiriana. — *Ministero delle Colonie, Direzione centrale degli Affari coloniali, Ufficio di studi coloniali. Monografie e studi coloniali.* No. 1, pp. 62 + 15 figs. Rome, January 1913.

General considerations on the climate, rivers and soils of Benadir. Description of experimental cultivations carried out by the writer at Caitoi and conclusions on the agricultural possibilities of the country.

Climate. — The Somali year is divided into 4 periods: *Gu* (100 days: beginning of March to the beginning of June); *Hagái* (60 days: beginning of June to beginning of August); *Der* (100 days: beginning of August to end of November); *Gilál* (100 days: end of November to beginning of March).

The temperature is uniform throughout the year - at Caitoi in the hottest period the daily temperature ranged between 17° and 35° C. The regulating factor of plant life is essentially water. *Gu* and *Der* are rainy seasons, the first being usually the period of most abundant rains; *Gilál* is the dry season, but not absolutely so as sometimes rains occur in December. In 1911 the rainfall at Caitoi amounted to 330 millimetres (13 inches).

Rivers. — The Juba has one chief flood-time, from the beginning of October to the middle of December, and a smaller flood after that. In the first period in many districts it is possible to deviate water from the river either directly or by raising it to a slight height, while in the second period it would have to be raised considerably, except in the last 9 miles of the course up to which point the action of the tides is felt. The Uebi Scebeli behaves very similarly: its small flood however is much more abundant so that it also would allow of water being derived directly from it. In view of the very great quantity of silt carried by the river water it is perhaps possible to improve certain districts by warping. Compared with Nile silt, the material carried down by the Uebi Scebeli is richer in organic matter and potash, not so rich in phosphoric acid and nitrogen, and very much poorer in calcium compounds. A sample taken at Caitoi gave the following results on analysis:

	Per thousand		Per d
Coarse particles	20	Calcium compounds	
Fine earth (below 1 mm.)	98.0	Total P ₂ O ₅	
Moisture	68.2	K ₂ O soluble in 25 % HCl	
Organic matter (loss on ignition)	14.0	Nitrogen	

By the hydraulic method. Velocity of current 0.2 mm. per second.

gross sand . . .	750
clay	250

us. — In the districts which, it seems, will be colonized first, the soils are excellent and very deep. Some soils of Somaliland are not so much affected to such an extent as to cause serious inconvenience; in Cairo cotton was not affected by it at all; besides, in Somaliland plants which characterize alkali lands are wanting. The analyses referred to here below, No. 1 is a sample taken in an experimental field of Cairo at the depth of about one foot. No. 2 is a sample taken from the upper layer of the sides of a canal which showed no efflorescences.

	No. 1	No. 2
soil at 105°C.	94.5 per cent.	96.2 per cent.
soluble salts	5.5 "	3.8 "
soluble sulphates	2.5 "	1.5 "
oxides and carbonates	Traces	

Experimental cultures. Cotton. — The varieties tested were: the cotton which has a short and not very abundant lint, but is resistant to drought and to disease; the Egyptian varieties (Affi, Sakel and Abassi); Upland and Caravonica.

The Egyptian cottons gave satisfactory results. Their period of growth lasted about 140 days. In plots that were never irrigated, sowing in the middle of May succeeded perfectly with about 150 (inches) of rain (up to October). In plots sown during the first 75 days of June one irrigation before sowing and the rain that fell during 55.75 mm. = 2.19 inches) were sufficient. The soil was worked to a depth of 10 inches, weeding was done four times. Though attacked by insects Affi yielded on 1.43 acres at the rate of 795 lbs. of ginned cotton per acre, an excellent crop.

Caravonica cotton attained exceptional dimensions and proved resistant to drought.

Both for Egyptian and for Upland cotton it was found that a plentiful supply of water at the moment of sowing and an abundant rain or irrigation about 45 days later were sufficient to ensure the crop. Consequently, without considering the rainfall, Upland cotton can be sown at the beginning of the Sobeli flood, from the end of August; and at the time of the Juba flood about the first days or the middle of October. The growth of cotton of the Egyptian type is possible from the end of April to the beginning of June on the Sobeli, and on the Juba, wherever it is found profitable to raise water for purposes of irrigation.

During the autumn floods of the two rivers (Der) the production of Egyptian cotton, using irrigation water, seems possible on the Sobeli and perhaps also in many districts of the Juba. Though, on account of the shorter duration of the flood of this river it is probable that Upland

land cotton, having a shorter period of vegetation, will prove more advantageous.

Cotton at Caitoi has been found to be damaged by the following insects. The strong south-west monsoon in May and June, which produces ebbing and blackening of the edges of the young leaves; *Oxycarenis* (*pennis*?); two varieties of *Disdercus*; the much more injurious *thebis* (*armiger* or *pelliger*?); *Gelechia gossypiella*, and some small cicadas which collect on the lower surface of the leaves which they pierce with their suckers causing them to become blistered and wrinkled; they do not do much damage to adult plants, but injure the young ones.

Tobacco.—The local production in Benadir is insignificant, and importation from Zanzibar and Arabia amounted in 1911 to 214 lbs., worth £5974.

From his experiments the writer concludes that in Benadir successive tobacco crops can be produced in the course of a year, first being planted from the end of April to the beginning of June, other from the beginning of September onwards, that is when water is available. Under normal conditions, the seedbeds give seedlings ready for setting out in about 40 days. The duration of vegetation from planting out to harvesting is 80 to 90 days. For the full development of plants one irrigation before sowing, at the beginning of June, and 134 mm. (2.19 inches) of rainfall in the second half of June were sufficient for the first crop, and for the second one irrigation (September 8) and 134 mm. (5.27 in.) of rain towards the middle of November. By cutting the plants down to the ground immediately after the harvest a secondary crop is obtained which under favourable circumstances amounts to one-half of the principal crop. Eastern tobaccos attain great development, producing large leaves with coarse ribs.

Maize.—Maize is the chief native crop of the region of the Scebeli. As with tobacco, two crops a year may be obtained, by sowing from the end of April to the beginning of June and from September onwards. In the writer's experiment the duration of vegetation was 100 days for the spring varieties, and 80 days for the early varieties.

Sesamum.—It is cultivated to a great extent in the places where water stagnates for a length of time. At Caitoi it produced 840 lbs. of clean seed per acre.

Earthnuts.—They ripened in 170 days from the date of sowing and yielded 231 cwt. of dry nuts per acre.

Lucerne.—It succeeded very well and resisted prolonged drought, producing in three cuts 67 cwt. of hay per acre.

Besides the above, experiments have been commenced with *hot glaziovii*, kapok (*Eriodendron aufractuosum*), coconut palms, and other woody plants. As suitable for hedges the writer recommends *Euphorbia Lemaireana*, *Jatropha Curcas*, *Euphorbia Tirucalli*, *Pongamia aculeata*, *Cassia florida*, *Bixa Orellana*, and *Cajanus indicus*. In moist soils he advises growing bamboos, especially the large species *drocalamus giganteus* and *D. strictus*.

The Agricultural Development of Madagascar.

Madagascar et Dépendances. I. L'Agriculture et l'Élevage. II. La Sylviculture. — *Mémoires des Colonies, Bulletin de l'Office Colonial*, Year 6, No. 61, pp. 7-10. Melun, January

European agricultural colonization is in full progress in Madagascar, 252 790 acres were under cultivation in 1912, as against 105 270 in 1911. The agricultural production has increased from 52 950 to 105 270 tons. The increase is chiefly in crops of poor quality, which were grown or not grown at all, in the preceding years, such as manioc, kitchen garden produce, etc. Consequently the value of the crops has increased in proportion to the area under cultivation, and is only 10 as against \$222 100. The value of the agricultural products, however, soon increase when the important plantations of vanilla, coffee, cacao, coconuts and ylang-ylang, which have developed in late years, are in full bearing.

Vanilla is one of the important cultivations and the plantations of it are extending most. It is calculated that the number of shrubs in the province of Mananjary alone will soon reach one million.

In 1912, the natives had 1 930 000 acres under cultivation, as against 1 660 500 in the preceding year. The Malagasy grow chiefly rice, also much manioc and maize. On the volcanic soils of Vakinankaratra, barley and wheat are raised; at the present time clove trees were on 2700 acres, coconut palms on 2500 acres and coffee on 1100 acres while 566 acres are under cotton and 882 acres under vanilla.

The live stock of the colony consists of 1968 horses and mules and 109 cattle; to the latter must be added the by no means inconsiderable number of wild cattle, which live in the desert zones of the west. The stock of ostriches belonging to the colony has now risen to more than 1000, while their number in 1910 was only 319. Crossing experiments have been attempted with ostriches from Abyssinia.

The Forestry Service of Madagascar has been occupied for several years in protecting the forests; these have suffered greatly from fires due to the native custom of sacrificing a wood to make "tavy" (rice fields), as well as from intensive exploitation. The Administration has directed its efforts to the reconstitution of the forests which have been destroyed, by planting native trees, and has also turned its attention to the creation of uniform stands by acclimatizing rapidly-growing trees of general usage.

A Retrospect of the Scholastic Year 1911-12 in the Agricultural and Forestry Schools and Colleges in Austria (1).

Übersicht auf das Schuljahr 1911-12 an den land- und forstwirtschaftlichen Lehranstalten in Oesterreich. — *Land- und forstwirtschaftliche Unterrichtszeitung*, Year XXVI, Nos. III and IV, pp. 239-265. Vienna, 1912.

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This report does not include the Agricultural High Schools in Vienna, nor the Agricultural Institutes of the University. (Ed.).

The three agricultural Colleges of Austria were attended, during the scholastic year 1911-12, by 350 students; of these 166 went to Tetschen-Liebwerd College, 72 to Tetschen-Liebwerd College, and 112 to Dublany College. At the Brewing Industry College in Vienna, 18 students were entered. The following table gives a review of the attendance of the immediate Agriculture Schools.

Intermediate Agricultural School in	Number of Students			
	I	II	III	Total
	Year			
Mödling	44	41	37	
Chrudim	82	76	78	
Kaaden	89	82	64	
Raudnitz	91	73	44	
Kloster-Hradisch	33	—	—	
Neutitschein	32	28	22	
Prerau	35	59	47	
Oberhermsdorf	33	13	15	
Czernichów	24	14	18	
Total	—	—	—	11

A ministerial decree of May 21, 1912, made an alteration in the examination of these intermediate schools; the subjects of the written examination being now chiefly agricultural practice, crop cultivation and stock raising, while the oral examination includes also questions on implements and machinery. Formerly, the students of both the written and oral examinations included the four above-mentioned branches and in addition, agricultural-chemical technology and land-improvement.

The Higher School for Fruit-growing and Wine-making at Klosterneuburg, and the Higher School for Fruit-growing and Horticulture at Eisgrub had during the last session 57 regular students and 16 occasional students, and 43 regular students and 2 occasional students respectively.

The number of students attending the Higher Forestry Schools were as follows:

	I	II	III	Total
	Year			
a. d. Mur	15	11	14	40
(two years' course)	30	51	—	81
ladt	40	29	25	94
ch-Weiskirchen	28	28	17	73
ig	45	39	26	110
Total	—	—	—	398

The number of students attending the 42 Austrian Agricultural Schools in the session 1911-12 was 1498. The Agricultural School for men at Otterbach, opened in 1911, had 16 students during its first

in the winter half-year 1911-12, 3127 students in all attended the winter Agricultural Schools established in Austria; that is an average of 36 students per school. During the official year, there were 17 Summer Housekeeping Schools, attached to the winter-schools; these were well attended.

The 10 Lower Forestry Schools had a total of 405 scholars. The figures for the official year gives the following numbers for the 4 Dairy Schools: at Doren 11, at Friedland 23 for the winter course and 20 for summer course, at Kremsier and Rzeszów 12 each and at the latter occasional students and 29 for practical work only.

In the 20 Agricultural Housekeeping Schools there were 763 women students, while 323 attended the 17 Summer Housekeeping Courses.

Of the special agricultural schools during the session 1911-12, the schools for Fruit-growing and Wine-making had an attendance of 297 and 8 Horticultural Schools of 162 students. The course on Alpine Forestry at Grabnerhof was attended by 135 students during the summer half-year 1911; while the Schools of Meadow Cultivation at Eger and Muth were each attended by 13 students during the official year 1911-12. The attendance at the School for the Cultivation of Hops and Vegetables at Saaz was 36, while 27 students attended the School for Preparation of Flax at Saar. The Vegetable Cultivation School at Brody had 116 and the Hop-growing School at Brody, 6 students. The courses of the Austrian Beekeeping School in Vienna were well attended. Of the 4 lower schools of instruction in the fermentation industry, the Brewery School at Mödling was closed owing to the small attendance. The other 3, the Brewery School in Prague and the Distillery Schools at Königliche Weinberge and Dublany, had 34, 27 and 20 students respectively.

206 - **New Regulations Affecting the Study of Agriculture at the University of Cracow.**

Neue Bestimmungen für das Studium der Landwirtschaft an der k. k. Universität Krakau. — *Land- und Forstwirtschaftliche Unterrichtszeitung*, Year CXXVI, Part IV, pp. 161-168. Vienna, 1912.

Since 1890, the philosophical faculty of the University of Cracow has included a department for the study of agriculture. The provisional arrangements of the curriculum and examination system of this department have undergone changes in several important particulars as the result of a regulation passed by the Ministry of Education on May 12, 1912.

The most important provisions are the following: The study of agriculture, together with all Agricultural Institutions, collections, other aids to scientific education, forms an integral part of the Faculty of Philosophy. Only those persons who are admitted to the Philosophical Faculty on the strength of possessing a matriculation certificate can become regular students. Others are admitted to separate courses of lectures only as unattached students. The complete course, which is necessary in order to obtain a final certificate and the diploma, lasts for four years.

The subjects are divided into obligatory and optional. Every regular student is required to attend the lectures on the former subjects according to the prescribed scheme.

Every regular student is required, at the close of each session, to take an examination for the purpose of showing the progress he has made in agricultural knowledge, the successful passing of this test being the condition of his admission to the next annual course. In order to obtain the leaving certificate and diploma, the student is required to pass the final examination at the close of his fourth year of studies. The examinations are *viva voce* and held in public. In order to gain the diploma, the candidate must write a paper embodying his own observations on the choice of the subject is left to him to select from those which are presented by the agricultural courses. In the diploma it is stated that the student, having completed his agricultural course and passed the examinations, is sufficiently, well, very well, or excellently equipped with the theoretical knowledge necessary for the agricultural profession. Regular students who can give proofs of a four years course of university study can also take the degree of Doctor of Philosophy according to the regulations customary in that faculty. The required doctoral thesis may deal with agricultural subjects, and in this case will form the work required from the student in his agricultural examination.

207 - **The Colonial Agricultural College at Tunis.**

L'Ecole coloniale d'Agriculture de Tunis. — *Bulletin agricole de l'Algérie et de la Tunisie*, Year XVIII, No. 20, pp. 469-478. Algiers, October 15, 1912.

The Colonial Agricultural College at Tunis was founded in 1905. Since then it has been attended by upwards of 300 students; of

engaged in farming in Tunis and 32 in Algeria; 20 who have remained in the colony have taken up professions which are only indirectly connected with agriculture; 103 have returned to France and are occupied in various professions; the others are in Morocco (7), in Indo China and Madagascar (1), in America, Egypt and Tripoli (8); lastly there are 16 in the military service and 9 have died.

The college farm disposes since last year, of a cultivable area of about 1000 acres, of which 54 acres are under vines and 22 under olives. The water supply is provided, by means of underground wires, with electric power for the agricultural machines.

Three present experiment stations are connected with the college: one for agriculture and agricultural botany, for the technique of farming and for agricultural parasitology. In order to keep the students in touch with the Central Station on the one hand and with the various Stations and the farmers on the other, the director of the Central Station was appointed inspector of agriculture for the whole colony. In the year 1910-11, 688 cwt. of improved seed wheat which had proved to be the best for the region were distributed among 60 colonists and as many farmers. Last year one half of the available area of the college was devoted to the production of the best seeds.

Numerous experiments have been conducted on various systems of farming, on the use of new implements for dry-farming, on methods of irrigation, on application of manures, on the growing of several varieties of cereals, on forage plants and vines, on the work of draught animals, on the windmills, on evaporation from the soil, irrigation, control of plant diseases and parasites, etc.

The curriculum is that of a college of agriculture. In the near future the successful passing of examinations at the end of a two-years course of instruction will confer the title of colonial agricultural engineer (Ingénieur colonial agricole).

The object of the foundation of this Institute was to give the future colonists of North Africa an opportunity of obtaining a thoroughly good agricultural education, both theoretical and practical, in the country in which they intended practising. For this reason the school admits, besides regular students, other pupils, the so-called "stagiaires agricoles." These are either intending colonists who have already gone to an agricultural college in France or who have already been engaged in practical farming in Europe and who wish to become acquainted, in the shortest time possible, with the special conditions of farming in the climate, before undertaking operations on their own account. They come to learn practically as volunteers on private estates but rarely, as colonists accept only those young men whom they have previously known. On the property and experiment fields of the Institute the students can follow all the various operations and attend the lectures and practical exercises which interest them as well as the courses of

By their intercourse with their fellow students, professors and lionists, they learn the habits and customs of the country; they afterwards extend and complete their practical knowledge in any part of the farm and finally utilize it to advantage in their own farms.

208 - The Swiss Dairy Association.

Der Schweizerische Milchwirtschaftliche Verein. — *Schweizerische Milchzeitung*, No. 103, pp. 1-2; Year 39, No. 1, pp. 1-2. Schaffhausen, December 24, 1912, and 3, 1913.

The Swiss Dairy Association has hitherto chiefly been employed in improving dairy technique and the instruction of persons engaged in the dairy industry.

The increasing importance of the Swiss Dairy Association — at present time about 220 million gallons of milk are technically treated — the present condition of trade, and the efforts of the peasants for organization, have induced the Association to aim at the following points in the future:

- 1) The improvement of instruction in dairy subjects.
- 2) Improvement of quality.
- 3) Stricter organisation.

As the first step to attaining these ends, and as a result of the experience of farmers in the matter of the Peasants' Secretariat, it was resolved that a Dairy Secretariat should be formed. The duties of this Secretariat were defined as follows:

- 1) The support of the Dairy Trade in commercial and legal matters.
- 2) The extending of the markets.
- 3) The promotion of literature on dairy subjects.
- 4) The establishment of an information bureau and return of prices.

The necessary funds are to be obtained from the contributions of the different branch associations and from the grants of the league.

209 - The Agricultural Associations of the Cape Province.

Landwirtschaftliches Vereinswesen der Kapprovins. Bericht des landwirtschaftlichen Sachverständigen beim Kaiserlichen Generalkonsulat in Kapstadt. — *Nachricht. Handel, Industrie und Landwirtschaft*, No. 139, p. 5. Berlin, December 3, 1912.

In Cape Province there have been hitherto four large Agricultural Central Associations: the Cape Province Agricultural Union, the Western Province Central Farmers' Association, the Western Province Board of Horticulture and the Eastern Province Board of Horticulture. The first of these was affiliated to the South African Agricultural Union, which covers the whole territory of the Union of South Africa.

On the occasion of last year's joint congress of the Cape Provincial Agricultural Union and the Western Province Board of Horticulture, it was decided to form a projected union of the four central associations. It has been accomplished and the society was entitled: "The Agricultural

of the Province of the Cape of Good Hope." It includes all various local agricultural associations of the Cape Province. The new association will appoint a central committee in which the representatives of the different classes of agriculturists will be represented. Admission to the South African Agricultural Union is contemplated.

Central Agricultural Shows in France in 1913 (1).

Cours Centraux agricoles en France en 1913. — *Journal Officiel de la République Française*, Year XLV, No. 18, p. 534. Paris, January 19, 1913.

By a decree of January 15, 1913, the Minister of Agriculture has decided that the Central Agricultural Shows in 1913 will be held in the following places:

Antibes	March 10-16
Montauban	May 5-12
Epinal	May 19-25
Tarbes	May 26-June 1.
Nantes	May 26-June 1.
Chateauroux	June 2-8
Gap	June 2-8
Evreux	June 9-15

The programmes can be obtained from the Ministry of Agriculture or the prefectures of the Departments concerned.

General Show of Breeding Animals in Paris in June 1913 (2).

Cours général d'animaux reproducteurs à Paris, en juin 1913. — *Journal officiel de la République Française*, Year XLV, No. 18, p. 535. Paris, January 19, 1913.

By a decree of January 15, 1913, the Minister of Agriculture has decided that a general show of breeding cattle, sheep, pigs and sheep-dogs be held in Paris on the Champs de Mars from Tuesday, June 17, to Sunday, June 22, 1913. The names of intending exhibitors must be sent to the Ministry of Agriculture before May 5 at the latest. Forms for the use of exhibitors will be obtainable from the Ministry of Agriculture and from the Prefectures from March 15.

Competitions organized by the Central Agricultural Association of Hérault, France, at Montpellier.

Cours organisés par la Société Centrale d'agriculture de l'Hérault, France. — *Bulletin de la Société des Viticulteurs de France, et d'Ampélographie*, Year XXV, No. 2, pp. 28-29. Montpellier, February 1913.

The Central Agricultural Society of Hérault is organizing, with a contribution of 5000 francs (about \$200) from the Minister of Agriculture, the following competitions which will be held, the first four on June 26, 1913 and the last during the month of November.

See No. 100, B. Feb. 1913.

(Ed.).

See No. 1602, B. Dec. 1912.

(Ed.).

I. Competition of sprayers.

A. Large sprayers, mounted on wheels and for pack mules

B. Knapsack sprayers :

a) with pump

b) with preliminary compression.

II. Competition of sulphururs and dusters.

a) Large sulphururs and dusters.

b) Knapsack and hand sulphururs and dusters.

III. Competition of large ploughing implements : two-share and t share ploughs, etc. ; hoes, scarifiers, harrows and surface pulverizers. These implements must work one or several rows of vines at a time. They may be harnessed to several horses.

IV. Competition of powders containing copper for the protection of vines against mildew.

V. A competition of vineyard ploughmen will be held in November.

For particulars apply to the " Société centrale d'agriculture de l'Hérault," 17 Rue Maguelonne, Montpellier.

213 - Exhibition of Machines with Combustion Motors for tilling Soil, at Galanta, Hungary, August 1913.

SPORZON, PÁL JUN. Az 1913. évi rendezendő motoros szántó-és [talajművelési] kiállításnak tervezete. — *Küldetek*, Year XXIII, No. 6, p. 169. Budapest, January 1913.

The Hungarian Agricultural Association is organizing, with financial assistance of the Royal Ministry of Agriculture, the Exhibition, mentioned in the title, which will be held in August 1913, together with experiments. Entries must be made not later than March 31, 1913.

The object of this exhibition is to present home and foreign machines that have been tested and to discuss them systematically. The resolutions adopted by the Committee are essentially the following :

The prescribed depth of the furrows will be 7 to 8 1/4 inches. Exceptions will be allowed. The exhibitor may provide his own fuel, this must be handed over to the Committee for examination before being used. The Committee provides fuel on request. For the experiment to be made with each machine an area of at least 7.41 acres is provided.

Prof. Pál Spozon, Director of the Machine Experiment Station at the Royal Hungarian Academy of Agriculture in Budapest has been charged by the Committee with the drawing up of the programme.

214 - General Agricultural Show at Tunis from April 18 to 27,

Concours général agricole à Tunis, du 18 au 27 avril 1913. — *La Revue des Colonies de l'Afrique du Nord*, Year 2, No. 5, p. 79. Algiers, January 30, 1913.

This Show, during which motor-culture trials will be held, take place around the same date as the Congress for the Advancement of Agriculture and Rural Science. It has been

Agricultural Show at Palestro, Dra-el-Mizan, Algeria, from May 22 to 25, 1913.

cours agricole à Palestro, Dra-el-Mizan, Algérie du 22 au 23 mai 1913. — *Office du gouvernement général de l'Algérie*, Year XIX, No. 4, p. 6. Paris, February 15, 1913.

Agricultural Show and International Exhibition of Automobiles and of Industrial and Agricultural Motors to be held at Algiers in March-April 1913.

cours agricole et exposition internationale d'automobiles et de moteurs industriels et agricoles à Alger, en Mars-Avril 1913. — *Office du Gouvernement général de l'Algérie*, Year X, No. 4, p. 6. Paris, February 15, 1913.

On the 22nd of March an exhibition organised by the Automobile Club will be opened at Algiers. The exhibition will include amongst its objects: agricultural motors and implements; chemical products in agriculture and manures; there will also be a show of breeding animals (April 16 to 20) a horse show; a cold storage exhibition; a cultural exhibition; as well as a mechanical ploughing competition. For information, apply to the Secretary of the Automobile Club Algérie: 23 Boulevard Carnot, Algiers.

Spanish-American Exhibition at Seville, Spain, from January 1 to October 31, 1916.

Boletín de Madrid, Year CCLII, Vol. IV, p. 880. Madrid, December 21, 1912.

A Royal Decree, dated December 20, 1912 postpones to January 1 to October 31, 1916, the Spanish-American Exhibition which was to have been held in 1914.

Exhibitions and Congresses of Agriculture in London in June 1914.

Tropical Life, Vol. IX, No. 1, p. 2. London, January 1913.

In June 1914 the following will be held in London: 1. The First International Exhibition of cotton, fibres, principal tropical produce and related matters. 2. The Fourth International Rubber Exhibition. 3. The International Congress of Tropical Agriculturists.

The first exhibition will include a section for palms and their products: fruits, kernels, oil, fibres, sugar, alcohol, etc., from coconut, oil palm (*Elaeis guineensis*), wild date (*Phoenix sylvestris*), palmyra (*Borassus Nipa*), nipa (*Nipa fruticans*), kittool (*Caryota urens*), buri (*Cordia alliodora*), sugar palm (*Arenga [Sagerus] saccharifera*), sago palm (*Metaxylon Rumphii*), etc.

International Rubber Congress from September 7 to 12, 1914, and International Rubber Exhibition from September 8 to October 10, 1914, at Batavia, Java.

Het Int. Rubber congres en Rubbertentoonstelling, Batavia 1914. — *Tijdschrift voor Nijverheid en Landbouw in Nederlandsch Indië: Mijden voor de Nederlandsch-Indische Maatschappij van Nijverheid en Landbouw*, Vol. 1, No. 6, pp. 371-377. Batavia, December 1911.

The exhibition will include the following sections: Botany, cultivation, collection, preparation and packing, parasites and other pests, means of control, economics (dwelling houses, hygiene, public health and education), wild rubber and kindred substances, rubber substitutes, guttapercha and balata, commerce and statistics, literature, value of rubber, methods of scientific investigation. — The Congress will include the following sections: botany and zoology, climate and soil, cultivation and harvesting, preparation, economy of production, synthetic rubber and commerce.

220 - Universal Exposition at San Francisco, by Authority of the United States Government, 1915, February 20 to December 4. Celebrating the Opening of the Panama Canal

In order to celebrate the opening of the Panama Canal, which was officially inaugurated on January 1, 1915, the Federal Government of the United States announces a Universal Exhibition which will be held in San Francisco, California, from February 20 to December 4, 1915. The Exhibition will include the following sections: fine arts, education, economy, liberal arts, various manufactures and industries, machinery, means of transport, agriculture, animal husbandry, horticulture, and metallurgy.

221 - Horticultural Congress in Paris, May 22, 1913.

Congrès d'Horticulture de 1913 à Paris, le 22 mai. — *Journal de la Société nationale d'Horticulture de France*, Series 4, Vol. XIII, pp. CVIII-CIX. Paris, December 1912.

The twenty-sixth congress organized by the National Horticultural Society of France will be held in Paris on Saturday, May 22, 1913, in the large hall of the Society, 84 Rue de Grenelle. All details may be obtained from the Office of the Society.

222 - The Sixth International Congress of the Dairy Industry, at Zurich, Switzerland, in 1914.

VI^e Congrès International de l'Industrie Laitière à Berne, Suisse, en 1914. — *La Vandoise*, Year 5, No. 4, p. 42. Lausanne, January 25, 1913.

The Universal Association of the Dairy Industry has entrusted the Congress of 1914 to Switzerland. The bureau of the Congress is established provisionally at the Liebefeld in Berne.

223 - International Dry-Farming Congress and Soil Products Exposition at Tulsa, Oklahoma, U. S. A., from October 22 to November 1, 1913.

CROPS AND CULTIVATION.

Method of Approximating Rainfall over Long Periods and Some of its Application.

AGRB
METE

ASS, A. E. Abstract from *Astronomical and Astrophysical Society of America*. — New Series, Vol. XXXVII, No. 940, p. 33. Jan. 3, 1913.

is found by a test extending over 43 years that the radial thickness of the yellow pine of northern Arizona gives a measure of rainfall in that region with an average accuracy of over 70 per cent. By using a simple formula, taking into account the conservation of the accuracy may be increased to about 75 per cent. By cross correlation of rings between all the hundred trees examined, the accuracy of the rings was greatly increased.

Trees from the vicinity of Flagstaff Observatory were measured. A number of 400 rings, and two of these to 500. It was found that all in that locality gave very similar records. A 21 year variation in the mean is shown in 400 out of the 500 years.

A shorter variation amounting to 16 per cent. of the mean was found. A period of 11.4 years. Its plot derived from 492 years of maxima which correspond in time with two maxima of rainfall years of records on the southern California coast. These in turn correspond to major and minor maxima in the temperature of that region for the period. The larger maximum of the latter occurs at the time of the minimum as averaged for 125 years.

Convenient Conversion Table for Frost Work.

DE, A. G. in *Monthly Weather Review*, Part I, Climatology, Climatological Survey for District 11; Vol. 40, No. 6, pp. 938-939. Washington, June 1912.

and heaters, evaporators, and frost protectors of various forms have come into such widespread use that a convenient table for the quick conversion of heat units into power units, and vice versa, seems to be needed.

It may be pointed out that the British thermal unit is the quantity required to raise the temperature of 1 pound of pure water at a density (39.1° F.) 1° F. This is the unit most frequently used in the United States and Great Britain, although it is deemed

that the old English units and the Fahrenheit scale be used as far as possible. A British thermal unit is equal to 0.252 calorie and equal to 777.5 foot-pounds. One therm will raise the temperature of 100° of water 1° C.; 1 000 therms equal 1 calorie, equal to 3.968 British thermal units.

Problems connected with the heat of water, it should be remembered, are not only the total heat is the latent heat plus the sensible heat. The heat required to evaporate water at a given temperature is 1 059.7 +

$0.428 T$, where T is given temperature. This holds for temperatures between 32° F. and 212° F., or 0° C. and 100° C.

In changing to steam at 212° F. a pound of water at 212° F. absorbs 970.4 British thermal units and the total heat is therefore 1150.4 British thermal units. This is starting from a temperature of 32° F. A pound of ice at 32° F. requires 142.4 British thermal units to change to water at 32° F. The latent heat of aqueous vapour may be found the following formula:

$$L_d = 1091.7 - 0.572 t_d$$

Where L_d = latent heat, and t_d = temperature of water. For convenience in frost work the following may be used:

- 1 kilowatt hour = 3412.66 B. t. u.
- 1 H.P. = 746.3 watts.
- 1 H.P. hour = 2544.6 B.t.u.
- 1 B.t.u. = 777.5 foot-pounds.
- 1 B.t.u. = 0.252 calories.
- 1 calorie = 1000 therms.
- 1 calorie = 3.968 B.t.u.
- 1 calorie per kilogram = 1.8 B.t.u. per pound.
- 1 pound of air at 32° F. occupies about 12.4 cubic feet.
- 1 pound of water at 212° F. occupies 0.0161 cubic feet.
- 1 pound of steam at 212° F. occupies 26.14 cubic feet.
- 1 pound of water at 212° F. contains 181.8 B.t.u.
- 1 pound of steam at 212° F. contains 1150.4 B.t.u.
- 1 pound of ice requires 143.8 B.t.u. to change to water.
- 1 cubic foot of water at 212° F. weighs 59.84 pounds.
- 1 cubic foot of water at 62° F. weighs 62.2786 pounds.
- 1 cubic foot of steam at 212° F. weighs 0.03826 pound.
- 1 cubic foot of dry air at 32° F. weighs 568 grains.
- 1 cubic meter of dry air at 0° C. weighs 1293.05 grams.
- Specific heat of water, 1.000.
- Specific heat of ice, 0.489.
- Specific heat of water vapour, 0.453 at atmospheric temperatures.
- Specific heat of air, 0.241.

Values given above are laboratory values, obtained by using distilled water. Ordinary drinking water is heavier than distilled water, because of matter in solution. Salt water is also heavier. It may also be marked that the temperature of the freezing point in ordinary use 32° F., or 0° C., may not hold for the freezing of water in plan W.N. Shaw instances one plant in which the freezing point is apparently 27° F., or -5° C. In other words, the change of water from the liquid to the solid state under natural conditions is somewhat different from change as shown in the laboratory.

Some of the values given above differ slightly from those found in textbooks, but they are the most recent.

Agricultural Study on Manganese.

SOTTIN, P. Etude agrolologique du manganese. — *Comptes Rendus de l'Académie des sciences*, Vol. 155, No. 23, pp. 1167-1169. Paris, December 2, 1912.

D. in *Annales de la Science Agronomique*, Year 30, No. 1, pp. 1-12. Paris, January 1913.

The writer proposes to study manganese systematically from an agricultural point of view, and to ascertain what becomes of the manganese fixed into the soil under the form of manganous salts.

Absorbent power of the soil. — By using the method adopted for ammoniacal salts, the absorbent power of the soil towards the salts of manganese has been demonstrated.

	Saline oxide of Manganese fixed by 50 grams of soil
Garden soil containing 85 % of lime	0.161 — 0.163 gram
„ „ „ 19 „ „ „	0.153 — 0.159
Fallow soil „ 5 „ „ „	0.097 — 0.103

The various elements constituting the soil have not the same influence on the absorbent power :

1. *Silicious sand* has no action.

2. *Limestone* is strongly attacked in the cold by solutions of manganese sulphate or chloride ; the whole of the acid remains in solution and dissolved calcium replaces the manganese rendered insoluble, in the proportion of the atomic weights. In fact the ratio $\frac{\text{Precipitated manganese}}{\text{Dissolved calcium}}$

was found to be 1.37 ; theoretically 1.375.

3. *Humus* does not play any part in the fixing of manganese. Peat or natural mould may, it is true, precipitate it owing to the calcium compounds they contain, but when these substances are freed from lime by the action of an acid, they show no power of fixing.

4. *Natural clay*, taken in the form of loam, has sharply reacted on the solution of manganese sulphate, giving the figure 5.04 for the ratio $\frac{\text{Fixed manganese}}{\text{Fixed calcium}}$. Clay has thus an action of its own independent of the action of lime.

As the soil possesses the power of fixing manganous salts, only small quantities of this element are to be found dissolved in the water of the soil. In fact the washing of 2 kilos of soil by 9 litres of water gave 17 milligrams of saline oxide of manganese, or 8.5 mg. of soluble saline manganese per kilo. This soil nevertheless contained 1.45 grams of soluble oxide per kilo. Slightly acidulated water dissolves a little more manganese : 0.037 to 0.088 grams of saline manganese oxide per kilo, according to the soils.

Consequently the drainage water contains also feeble proportions of manganese : 0.25 to 0.5 milligrams of saline oxide of manganese per litre. It is enriched by the addition of sulphate of manganese to the soil. In 1912 the writer collected during a year the drainage water from two cylinders, each of them watered in the same way and each containing 2000 kilos of the soil ; one of the two had received 0.5 gram of 4000 to 4000 manganese

by means of superficial watering; the other had not received any addition. Only the sulphuric acid passed into the drainage water without the corresponding manganese.

Summing up, arable soil renders manganese insoluble and retains it in the same way as it absorbs ammonia, potash and phosphoric acid.

Solution of the natural manganese of the soil in various reagents.—In regard to concentrated acids the figures obtained are so large in comparison with the quantities of manures usually employed that they do not present much interest from an agricultural point of view. On the contrary, the writer has found in the soils he examined such quantities of manganese soluble in acidulated water (1) as were sufficient to allow of an easy determination. It would be desirable, however, to know if the content of manganese soluble in acidulated water is connected with the requirements of this soil as to manganese manure. In order to solve this question a determination of the manganese soluble in weak reagents: water, acidulated water and ammonia, should be made in all those cultural experiments which are carried out on manganese manures.

227 - The Black Soils of the Oued R' Dom Valley in Morocco

GIN, G. Les terres noires de la vallée de l'Oued R' Dom au Maroc. — *Comptes Rendus de l'Académie des Sciences de Paris*, Vol. 155, No. 23, pp. 1166-1167, Paris, December 2, 1912.

Three samples of arable soil taken from the very fertile valley of Oued R' Dom in the neighbourhood of Dar Caïd Ben Ali in Morocco have been investigated by the writer and M. Mallet; they have the following composition (per thousand):

	I	II	III
Silica	296.3	318.2	464.1
Alumina	636.3	609.4	562.5
Oxide of iron	3.8	4.2	4.5
Phosphoric acid	1.2	1.4	1.3
Carbonic acid	5.4	5.8	5.8
Lime	5.8	6.1	6.3
Magnesia	2.9	3.1	3.0
Potash	4.1	4.7	4.3
Organic matter	24.6	26.6	32.1
Loss at 110°C	8.2	7.9	7.4
Combined water	10.2	9.2	8.4
	998.8	996.6	997.5
Organic nitrogen	1.52	1.72	1.74

The saturation capacity of these soils is 51.2 per cent. and the retention capacity is 34.3 per cent. Thus, one cubic foot can hold a

(1) 5 cubic centimetres of nitric acid per litre, after cessation of effervescence. *Comptes Rendus de l'Académie des Sciences de Paris*, 1898. *Bull. Agronomique et des laboratoires agricoles. Méthodes d'analyses des sols*. It has been

lions of water of imbibition and 1.25 gallons of water of combination, total of 3.4 gallons.

though the soil appears completely dry in summer, yet plants can grow in it during the hot months, so that the blacksoils lend themselves to dry-farming; in explanation of this the writer suggests that the soil must possess the power of absorbing the water of combination hydrated alumina, $Al_2O_3 \cdot 3H_2O$, which remains in the clay after appearance of the water of imbibition.

The characteristic black colour of the soils of the Oued R' Dom, and that of the Tirs of Morocco, is due to an amorphous humic substance resulting from the decomposition of vegetable matter, which has been transformed by gradual oxidation. It is partially soluble in caustic potash, forming a brown liquid.

The formation of the black matter is analogous to the process which takes place in peat and is promoted by the alternated wet and dry condition of the soil, the latter facilitating free access of air by the production of

Irrigation Investigations at the Utah Experimental Station.

PROF. J. A., STEWART, R. and MERRILL, L. A. *Bulletin of the Utah Experimental Station*, Nos. 116, 117, 118, 119, 120, pp. 1-240. Logan, Utah, September 1912.

During the period 1902-1911 a large number of crops were grown on Ardenville experimental plots with various amounts of irrigation water, in order to investigate the influence of the water supply on the yields of crops. The average results for five of the chief crops are as follows:

Yield in lbs. per acre.

Crop	Irrigation water in inches								
	5	7 ½	10	15	25	30	35	50	55
Wheat	4 969	5 545	5 684	6 279	6 672	—	7 229	7 999	—
Barley	—	10 757	12 762	13 092	13 856	14 606	—	—	12 637
Oats	—	9 094	6 942	8 369	8 606	8 133	—	9 949	—
Alfalfa	—	6 080	8 053	8 636	10 076	10 271	—	11 528	—
Hay	2 310	2 730	2 925	3 405	4 005	3 660	—	3 795	—

The yields increase with the amount of irrigation water applied, but each additional increase in the irrigation water corresponds with a diminishing increase in yield, till a point is reached where further application merely reduces the yields. This point is reached at 30 to 40 inches for wheat,

alfalfa, beet and potatoes, but lies between 35 and 55 in. for maize. Further, when certain crops were grown without any irrigation at all, the yield produced from 67 per cent. for potatoes to 85 per cent. for wheat and maize, the yield obtained when $7\frac{1}{2}$ in. of water were applied. As the total amount of irrigation water in any district is usually limited, the question of utilizing it to best advantage is of great importance and the above results would indicate that far larger yields of produce could be obtained by spreading a given amount of water over a large area than by concentrating it on a smaller one.

Other experiments for investigating the number of irrigations and the time of year at which they should be applied showed that in a general way the best results were obtained when the applications of water were distributed so that the soil remained approximately equally moist throughout the growing season; with wheat and maize, the supply of moisture was specially important during the period of seed formation, i. e. the period of transference of food material from the straw to the grain; for beet and potatoes, July and August were the two important months. Later applications did not appear to produce any material increase; for alfalfa the total yield was little affected whether the water was applied just before or just after each cutting. On the Greenville farm, where the annual rainfall is over 15 in., and where the soil is saturated at the time of planting, no advantage was obtained by irrigating before the time; but applications of spring flood water (which would otherwise be to waste) after seed time but before the usual irrigation season gave a slight increase in yield, this increase being greater the later in the season the application could be delayed. Two methods of application were tried, flooding and furrowing — and the results suggest that cultivated crops were irrigated equally well with either of the methods, while non-cultivated crops were better when flooded.

In a certain number of the trials the crops were sampled, just after each irrigation, and subjected to analyses in order to ascertain the proportion of leaves, stalks, etc., in the plants, and the chemical composition of the different parts. The following conclusions were reached.

The plants grown with much water tend to be more leafy and, in the case of cereals, to have relatively lighter heads — the percentage of grain in the wheat crop varying from 33 per cent. where 50 in. of water was used to 44 per cent. with only 5 in.; these differences become more marked early in the season.

The percentage of water in the parts of the plant above ground increases with the amount of water applied, while in the underground parts (tubers of potatoes and roots of beets) it tends to remain constant.

The ash content on the other hand increases with the irrigation water in the aerial parts of the plant, and varies inversely with the irrigation water in the subterranean parts of the plant.

The protein content varies inversely with the irrigation water in the aerial parts of the plant.

sugar beets and potatoes the percentage of *carbohydrates* (starch + increases with the irrigation water. Additionally, the protein content was also estimated in the wheat crops the distribution of equal amounts of irrigation water was varied, the results show that when the greater part of the water is applied in the season the percentage of protein is highest, and the more the applications the higher this value appears to be.

Experiments with Butz' Drains in the Peat Moor near Bernau the Chiem See.

TRUNG, M. Versuche mit Butz'scher Drainage (1) im Hochmoore bei Bernau am See. — *Der Kulturtechniker*, Year XVI, No. 1, pp. 51-53, Breslau, January 1, 1913. In the drainage of the Lake Chiem moor, Butz' new drainage system was used.

Mr Butz selected as field of his operations an area of peat moor the Bavarian Institute of Moor Culture is cultivating at present. The depth of the peat bed reaches 18 feet. In the year 1911 about 100 acres of this moor were drained by means of narrow ditches about average depth. These ditches were deepened in 1912. In spite of the gradual deepening of the ditches their sides showed a strong tendency to cave in. It became necessary to open each ditch to the required depth and to put in immediately the drain and to cover it with stones. Under these unfortunate conditions a somewhat higher amount of labor was employed for the drainage than that stated by Herr Butz. The tables which accompany the text it appears that to the rather great cost of this moor draining the constitution of the moor as to its content and to the presence of wood, roots, etc., as well as the effect of the drains, contributed more than the system employed.

Use of Dynamite for breaking up Land (2). Experiments conducted at the Agricultural Station of Lausanne (Switzerland).

SERRE, C. La culture du sol à la dynamite. — *Procès-Verbaux de la Société Vaudoise des Sciences Naturelles*, No. 3, 1913. (Séance du 22 janvier). Lausanne, January 1913.

In order to bring under cultivation virgin soils which are not attacked by the plough, American farmers sometimes use dynamite. They make blast-holes 13 to 23 feet apart and 30 to 40 inches in diameter at the bottom of which they place dynamite cartridges containing 20 per cent. of nitroglycerine and weighing 5 to 8 3/4 ounces; the

Butz' system consists in the use of long wooden drains, having a square cross-section made of boards 0.4 to 0.8 inch thick, 2 to 8 in. broad and usually 13 feet long, laid together and forming one long drain. (Ed.).

See: CORNELIO GUERCI, Esperimenti nel dissodamento del terreno col mezzo della dinamite. — *Annali della R. Accademia di Agricoltura di Torino*, Vol. 1, p. 37, Turin, 1911.

See also No. 2529, *B. Aug.-Sept.-Oct.*, 1911; No. 2530, *B. Dec.*, 1911; No. 2531, *B. April*, 1912; No. 777; *B. May*, 1912; No. 1398, *B. 1900 to 1900*. (Ed.)

holes are then filled with sand or clay, and well rammed. Each one is provided with a fulminate cap and a match, an extremity of which protrudes a few inches above the soil. The cartridges are fired either by lighting the matches direct or by electricity. The explosion raises the ground, and breaks it up sufficiently to allow it to be easily ploughed. The cost of the operation is reckoned at £2 8s to £4 per acre.

In order to form an opinion on the utility of this process, in Switzerland, the Federal Institution of Agricultural Chemistry at Basle made, in November 1912, some experiments in the presence of Colonel Ribordy at Planisse sur Saint Léonard (Valais). Some land intended for a plantation of fruit-trees was prepared by exploding a spot to be occupied by each tree a cartridge of about $8\frac{3}{4}$ oz. of "Gamsen" a safety explosive manufactured by the Gamsen (Valais) works and containing about 24 per cent. of nitro-glycerine. This operation prepares the ground very well for planting young trees. The explosion of the charge placed at a depth of 40 inches, raises and breaks up a volume of from 35 to 52 cubic feet of earth in the form of an inverted cone, the base of which measures on the surface of the soil about 6 in. The grassy sods were projected to a short distance. In all that will be required before planting will be to shovel out a hole large enough to accommodate the roots so that they may develop without encountering resistance. The whole operation costs about 1 shilling a tree, while the holes for planting made by hand labour often cost 2 shillings and their volume does not exceed 17 cub. feet. Experience has shown that trees planted in soil prepared by dynamite developed more rapidly and came into bearing earlier than those planted in the usual manner.

It appears also that dynamite might be advantageously used in preparing land for plants possessing deep roots, such as the vine, especially when the subsoil is hard and compact. With holes at 16 ft. apart and cartridges containing 5 oz. to $8\frac{3}{4}$ oz. of explosive (which seems sufficient), the cost of breaking up the land does not exceed 1 shilling an acre, while the same work done by hand to a depth of 2 feet would cost about four times as much.

Among other experiments one was made in a moist soil on which it was intended, after drainage, to grow lucerne. The resistance of the soil to the water did not allow of useful work being done; the energy of the explosion was spent in projecting the soil to a great height, making the surface uneven and measuring about 17 cub. ft. This method does not therefore seem suitable for soils possessing a water table not far from the surface.

By using the so-called safety explosives (cheddite, gamsite, phalite, telsite, etc.) prepared by various factories, the soil can be worked without incurring any serious danger, provided of course that elementary precautions be taken to guard against accidents.

Composition of Russian and Foreign Fish Manures and of other Manures of Marine Origin.

SWITSCH, P. S. and KOTOLOW, G. I. K voprosu o sostavie russkikh o inostrannykh tukov i drugikh udobrenij «moskago» proiskhozhdenia. — *Jurnal Opeinoi ommi* (Russisches Journal für experimentelle Landwirtschaft), Year XIII, Part 6, 1-814 (815-816). St. Petersburg, 1912.

This article gives useful information regarding the composition of herring manure, comparing it with different fish manures and similes from other countries. For the latter purpose, the results of analyses of the most various manures of "marine" origin have been collected, many of the data having been taken from the agricultural

following table gives the composition of three kinds of Russian guano, which were analysed at the St. Petersburg Agricultural Society of the Chief Office of the Land and Agricultural Organisation

At the end of the summary, the writers come to the following conclusion: All fish manures can be divided into two groups; the first includes those which are relatively poor in phosphoric acid (not more than 7 per cent), those of the second group have a high phosphoric acid content (12 per cent.). The Russian herring manures examined in the above-mentioned laboratory belong to the first class. A third class is formed by those made of lower marine organisms, and characterised by a low percentage of phosphoric acid (0.6 to 1.6; in the case of *Fucus* only 0.1 per cent.). Various manures contain very different amounts of nitrogen. In the first class, the nitrogen content varies from 6 to 13 per cent.; the second more even, ranging from 6 to 9 per cent.; the representatives of the third class have from 1.4 to 5.3 per cent. of nitrogen and the *Fucus* only 0.35. All the manures mentioned, except the American guano, are extraordinarily deficient in potash, averaging only about 1 per cent. Data respecting the fat content are only available in the case of the first and third classes; in the former, this varies from 4 per cent. to 10 per cent.; Russian herring guanos from Sakhalin are almost the poorest while the Vladivostok guanos occupy a middle position from this point of view. The fat content in the third group varies from 0.7 per cent. to 1.5 per cent.

The Composition of Russian Herring Manures.

In 100 parts of dried substance:														
	Hygroscopic water	Loss on ignition	Ash	Total nitrogen	Total phosphorus	Total fat	Ash insoluble in HCl	Extracted from the ash by 10% HCl						
								Silica	Clay	Oxide of iron	Lime	Magnesia	Potash	Soda
Manure from Sakhalin: I . .	9.796	81.656	18.344	10.280	6.748	5.808	1.816	0.129	—	—	6.208	0.551	1.029	1.530
Manure from Sakhalin: II . .	10.630	88.356	11.664	10.918	4.268	6.240	1.064	0.211	—	—	2.915	0.430	1.032	1.498
Manure from Vladivostok .	6.660	86.800	13.200	11.770	4.850 ⁽¹⁾	11.612	—	—	0.12 ⁽²⁾	0.13 ⁽²⁾	4.46 ⁽²⁾	0.33 ⁽²⁾	0.84 ⁽²⁾	0.63 ⁽²⁾

Agricultural Value of Carbonate of Lime recovered from Causticising Plant.

BRUCE, K. J., in *British Association for the Advancement of Science*. Dundee 1912.
 DON M. (Agriculture) m 17. London.

The writer states that great quantities of precipitated carbonate of lime are obtained as a by-product from causticising plant, and that in parts this precipitated chalk is thrown on the dump-heap as a by-product, while it may be that the surrounding fields are hungered for carbonate of lime.

This waste product as obtained from the dump-heap contains about 10 per cent. of moisture, and is a somewhat tenaceous substance. The dry residue is mainly carbonate of lime; small quantities of other substances are present, which vary considerably according to the process. A little silicate of lime is always present, and there is generally some organic matter. The material is always alkaline; the alkalinity is due in some cases due to calcium hydrate, and in others to sodium hydrate carbonate; it varies greatly; in certain samples an alkalinity due to sodium hydrate corresponding to 6 per cent. of sodium hydrate was found, in other samples the alkalinity was under 1 per cent.

At present little use has been made of this substance; one reason for this is that in the wet state it is difficult to spread; it is however easily dried when it forms a fine powder, which is easily distributed.

A number of field experiments have been carried out with this carbonate of lime, in which it has been compared with other forms of lime, such as burnt lime and ground limestone. The experiments have all been made on land deficient in lime and very subject to finger-and-toe in wheat. So far as they have gone they show that whether the results are measured by increase of crop or by diminution of finger-and-toe disease, the precipitated carbonate of lime does at least as well as any other form of lime. It has, on the whole, acted better than an equal quantity of commercial ground limestone, as it is very much finer, and is therefore more thoroughly mixed with the soil. It was found that the presence of a small percentage of sodium hydrate and carbonate had no special effect on its action.

The Secondary Effects of Phonolite.

ASSAER, H. Ueber Nebenwirkungen des Phonoliths. — Aus dem Institut für landw. Produktionslehre und der Versuchswirtschaft der k. k. Hochschule für Bodenkultur in Wien. — *Mitteilungen der landwirtschaftlichen Lehranstalt der k. k. Hochschule für Bodenkultur in Wien*, Vol. I, Part 3, pp. 271-284. Vienna, January 15, 1913.

One of the questions raised about the manurial value of phonolite is the eventual secondary effects on the utilization of the nitrogen of the soil, several opinions being current. The writer proposed studying the effect of phonolite on the utilisation of the nitrogen of the soil and of plants in loams and sandy soils.

Arrangement and results of pot experiments.

Manure	Fots nos.	Barley						Forage maize					
		Number of		Crop in grams		Grain p. cent.		Straw p. cent.		Number of plants	Crop, grams	Dry Matter per cent.	Nitrogen per cent.
		Plants	Stems	Grain	Straw	Dry Matter	Nitrogen	Dry Matter	Nitrogen				
Sandy soils.													
...	17,24,31	18	89	52.5	106.2	89.96	2.656	91.08	1.542	29	122.5	90.30	0.920
P.N.K.	18,25,32	18	96	55.9	114.4	89.44	2.637	91.80	1.409	30	111.8	91.92	0.990
P.N.φ	19,26,33	18	78	48.4	101.2	89.28	2.639	91.72	1.636	30	102.6	92.12	0.907
P.N.K.φ	20,27,34	18	82	47.9	100.4	89.58	2.510	92.36	1.532	30	108.2	92.14	0.898
P.K.	21,28,35	18	63	61.0	77.0	89.28	2.063	91.94	0.725	30	82.9	90.76	0.994
P.φ	22,29,36	18	59	55.3	74.9	89.22	2.048	92.00	0.822	29	87.0	91.86	0.975
P.K.φ	23,30,37	18	70	63.7	81.3	89.34	2.031	91.72	0.672	30	86.3	91.24	0.954
Loamy soils.													
—	38,47,56,65	24	75	58.9	87.5	89.52	1.883	92.40	0.457	37	59.4	90.70	0.884
P.	39,48,47,66	24	69	62.6	84.0	89.56	1.815	92.24	0.443	38	49.5	91.12	0.983
P.N.	40,49,48,67	24	144	109.3	150.8	89.62	2.075	94.36	0.747	39	75.8	91.34	0.847
P.N.K.	41,50,59,68	24	145	117.8	164.7	89.44	1.999	91.98	0.716	37	69.9	91.06	0.881
P.N.K.φ	42,51,50,69	24	139	91.5	154.8	89.86	2.201	92.04	1.129	39	76.6	91.56	0.896
P.N.K.φ	43,52,61,70	24	140	116.9	161.2	89.38	2.024	91.72	0.605	39	61.1	91.00	0.895
P.K.	44,53,62,71	24	78	70.4	89.1	89.46	1.780	91.92	0.435	40	45.5	91.40	0.972
P.φ	45,54,63,72	24	72	61.2	81.2	89.24	1.832	91.52	0.547	38	50.2	91.20	0.922

each pot 9500 grams of soil were placed, the same weight being in the sandy and the loamy soils. The former contained 8.42 per cent moisture, the latter 17.98 and was besides very rich in phosphoric

acid. It represents 0.5 gram of phosphorus pentoxide as monocalcium phosphate; N = 0.6 gr. of nitrogen as calcium nitrate; K = 1 gr. of potash as potassium chloride; P = 10.8 gr. of phonolite containing 9.28 per cent phosphoric acid.

The results given in the annexed table do not seem to show that the action of phonolite exerted any useful action, save by the direct action of potash, and in the case of the very poor sandy soil not manured with potash, but not in the sense of favouring the fixation of nitrogen; in all other cases, as a secondary effect, a diminution of yield was observed. In the case of simultaneous application of phonolite and nitrate of lime, the yield was accompanied by a lesser utilization of the nitric nitrogen. Hence the opinion that phonolite acts as a denitrifying agent.

Summing up, it appears that there is no evidence that phonolite has any appreciable secondary action; the contrary rather seems to be the case. Evidently, apart from its value as a potash manure, it should never be recommended excepting where its favourable secondary effects have been ascertained by means of careful experiments. Lastly, it is to be noted that the results disagree with those obtained by Prof. Hiltner, but agree with Prof. Pfeiffer and his collaborators.

3. Experiments on the Fertilizing Property of Sulphur.

SCHENKOFF, V. V. Novye Opiti s Fiermim ziretom, kak oudsbrenjem. — *Journal of Agronomy* (Russisches Journal für experimentelle Landwirtschaft), Year XIII, 6, pp. 817-821 (821-822) + 1 plate. St. Petersburg, 1912.

The writer has made experiments (1) to ascertain whether flowers of sulphur have any effect on the growth of barley and rye. The experiments were tried out in the experiment garden of the Agricultural Institute in a very rich clay soil after beets.

The soil analyses gave an average sulphuric acid content of 0.082 per cent. It is well known that most soils are poor in sulphuric acid, the average varying, according to Hart and Petersen, from 0.033 per cent to 0.10 per cent, almost always remaining below 0.10 per cent. The sulphuric acid present in the experimental soil was thus an average of 0.082 per cent.

The sulphur was applied before sowing (at about $\frac{1}{3}$ oz. per sq. yd., or 1 lb. per acre). The sowing was done on February 25, 1912.

The favourable effect of the sulphur showed itself from the beginning. The stronger growth and brighter green of the plants on the treated plots. This result persisted till the crops ripened.

The crop reaped on July 26 was weighed (grain and straw together). The average weight per plot of 2 sq. m. (2.4 sq. yds.) was as follows:

	Barley	Rye
	lbs.	lbs.
Without sulphur.	13.0	9.5
With sulphur.	16.5	12.75
Increase due to sulphur.	3.5	3.25

These figures clearly show the good effect of sulphur upon the crop used for the experiment.

235 - The Effect of the Concentration of Nutritive Solutions upon Absorption by Plants.

POUGET, I. and SCHUSCHAK, D. Vlijanje koncentracij pitateljmeh rastorov na klorotschenie rastenjem. — *Jurnal Opetnoi Agronomii*, Year XIII, Part 6, pp. 823-829) + 3 figs. St. Petersburg, 1912.

The writers have investigated in the laboratory for Applied Chemistry of the University of Algiers the absorption by wheat plants 2 to 4 weeks of various nutritive substances from solutions of different degrees of concentration and from aqueous soil extracts.

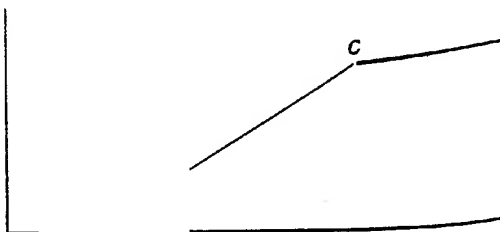
Their results, using nitrate nitrogen, were as follows:

I

Concentration of the solution in mg. nitro- gen per litre	0.5	1	2	4	8	16	32	64
Nitrogen absorbed, mg.	0.04	0.11	0.2	0.41	0.8	1.61	3.2	6.4

II

Concentration at the beginning, mg. nitro- gen per litre	0	0.5	1.0	2.0	4.0
Average concentration during the ex- periment, mg. per litre	0	0.43	0.87	1.65	2.76
Absorbed nitrogen, mg.	0	3.29	6.82	11.7	13.7
Plant weight (dried at 100° C.) mg.	0.364	0.399	0.418	0.433	0.414
Increase over plants grown without nitrogen	0	0.035	0.054	0.069	0.060



The writers summarize the total results of their experiments as follows :
 where the concentration of the solution was very low (under 0.1 mg. per liter for phosphoric acid) no absorption was observed ; on the other hand the plants excreted from their roots the nutritive matter which they had previously absorbed in the organic or inorganic form (point A of the curve). As the concentration rises, the absorption is at first more rapid than the rise in concentration, till it reaches a certain point (B on the curve); at this point the absorption is strictly in proportion to the concentration of the solution ; subsequently a point is reached (C on curve) when the ratio is disturbed, and the absorption increases more slowly than the concentration rises ; eventually, the absorption ceases to depend upon the concentration (the absorption of the nutritive substance from the solution is regulated by its assimilation by the plant). It is clear that the positions of the points A, B and C upon the absorption curve depend upon the condition of the plants, their stage of growth, and upon external conditions (light, warmth, etc.). It should also be noted that with solutions of very low concentration, the nutritive substance is absorbed much more readily than water.

These results show that soil solutions, in spite of their great want of concentration, play a very important part in crop development, as has been shown by Schlösing (the younger) and the writers in the case of the absorption of phosphoric acid.

If the concentration of the soil solution is higher, as regards elements necessary for the nutrition of the plant, than the limit of concentration C (see above curve), the yield of the crop will depend upon other factors (light, biological, etc.).

On the other hand a minimum quantity of one, or all, the nutritive substances is present and the concentration falls below the limit C, the absorption of the substance in question and therefore the yield of the crop is strictly dependent upon this concentration.

Transpiration in Plants in Relation to Atmospheric Humidity.

STONERY, E. G. and KESSELBACH, T. A. *Bulletin of the Agricultural Experiment Station of Nebraska*, Vol. XXIV, Article VI, (Bull. 128), pp. 4-6. Lincoln, Nebraska, 1912.

The following experiment is a continuation of the work already reported by the writers (1). The same apparatus was used as before, but instead of containing the maize plants were put into two greenhouses, in which the air was kept as moist as possible, whilst the other was kept as dry as possible and therefore had a comparatively dry atmosphere. A record of the temperature and relative humidity was kept, and the effect of the different conditions on the plants is shown in the following table:

24th Annual Report of the Agricultural Experiment Station, Nebraska, pp. 91-107.
 No. 1647, B. June 1911. 2000 to 4000. (Ed.)

	Dry greenhouse	Humid greenhouse	Ratio: Humid to dry
Mean temperature	85° F.	81° F.	—
Total dry weight of plants in grams	670	862	—
Total water used in kilogr. . . .	278	184	—
Gr. of water per gr. of dry weight	340	191	1:0.56
Water evaporated from 36 sq. in. of free water surface (grams) . . .	3 891	2 187	1:0.56

The plants in the humid greenhouse attained the greatest dry weight though the total leaf area was approximately the same in both cases but the amount of water used per unit weight of dry matter was about twice as great in the dry as in the humid house and this ratio was produced exactly by a comparison of free water surfaces exposed in two houses.

237 - The Wilting Coefficient for Plants in Alkali Soils.

KEARNEY, T. H. *United States Department of Agriculture, Bureau of Plant Industry, Circular No. 109*, pp. 17-25: Washington, January 1913.

The writer used the same apparatus as Briggs and Schantz in their experiments on the wilting coefficient of plants (1). Wheat seedlings were employed and a range of soils containing from 0.183 to 0.759 of water-soluble material per 100 dry soil. The results show that where plant growth is not entirely prohibited by excess of alkaline salts, the presence of the salts does not prevent the plant from drying out the soil to the same extent as when it is in a normal condition.

238 - Comparative Transpiration Experiments with Awned and Awnless Barley.

SCHULZE, G. W. *Vergleichende Transpirationsversuche zwischen begrünter und unbegrünter Gerste*. — Aus dem Institut für Pflanzenzüchtung der k. k. Hochschule für Landwirtschaft in Wien. — *Mitteilungen der landwirtschaftlichen Lehranstalt der k. k. Hochschule für Bodenkultur in Wien*, Vol. I, Part 3, pp. 285-308 + 3 plates. Vienna, January 1913.

The chief result of the transpiration experiments is the confirmation of the opinion held by v. Proskowetz and other investigators that awnless varieties of barley have in comparison with the awned barleys an extraordinarily low energy of transpiration: under other normal conditions, this reaches a maximum of only one-sixth of that of awned Hanna barley.

Further, in awnless barleys a continuous increase of transpiration was shown to accompany the development of the ears. In these experiments the maximum was reached at the milky stage.

The observation made during all the stages of development that artificial removal of the awns from the ears did not place them on the same level with the awnless barleys in respect to transpiration, attributed, by means of special experiments, for the most part to increased loss of water due to the wounds.

(1) See No. 1.

transpiration experiments made between *Hordeum vulgare* var. "hooded barley" and awnless barley gave, at the milky stage, cent. lower transpiration for the awnless barley. Experiments made with awned Hanna barley and the same artificially of its awns, together with awnless barley under diffused light and direct sunlight gave the following result: under direct sunlight barley, in comparison with artificially awnless barley and especially hooded barley, transpired relatively more than under diffused light. Percentage figures obtained for the increase of transpiration at the stage under direct sunlight stood in the ratio of 44:38:19.

Results of Selection on Wheat Yields in Nebraska.

OMERY, E. G. Wheat Breeding Experiments. — *Bulletin of the Agricultural Experiment Station of Nebraska*, No. 125, pp. 1-16. Lincoln, Nebraska, March 1912.

For the systematic improvement of Turkey Red Wheat was commenced at the Nebraska Experiment Station, this wheat having proved adapted to withstand the cold dry winters of that region.

The method of selection from single ears was adopted, and during the years 1907-10, 26 pure strains thus obtained were tested in field plots. Average yields varied from 28.8 to 40.7 bushels per acre, whilst the control sown with the original stock of Turkey Red yielded 35.1 bushels.

The following year, seed of three of the most promising strains was distributed amongst farmers of the district. In each case the test plot of eight acres in extent and formed part of a larger field, so that the selected and unselected seed could be compared. In the 21st year made the local Turkey Red yielded on an average 21.9 bushels, whilst the improved grain yielded 25.9 bushels per acre, showing an increase of 4 bushels per acre.

The experiments are being continued and a new strain is now ready for distribution which appears to be superior to any other so far tested, especially with regard to colour and quality.

Asparagus Breeding for Rust Resistance.

OS, J. B. U. S. Department of Agriculture, Bureau of Plant Industry, *Bulletin* 53, 60 pp. Washington, January 1913.

The Massachusetts Asparagus Growers' Association was organised in 1908 to produce by breeding a variety of asparagus resistant to the rust *A. asparagi*. The cooperation of the United States Department of Agriculture was obtained, and breeding experiments were begun in 1908; these were conducted partly in greenhouses at Washington, D. C., and partly in the field at Concord, Mass. A large number of varieties both from America and Europe were planted, and in the autumn of 1908 they were inspected and all specially resistant plants marked, the work being repeated in 1909 and 1910.

A large number of correlation studies were made between the various vegetative characters of the plants, so that as the rust appeared, the useless ones could be recognised at an early stage and discarded. The useful ones were preserved.

tables show that the asparagus plant has a stable and permanent vigour and is well adapted to breeding work.

Further studies show that there is little relation between vigour, measured by growth, and rust resistance, but that the latter quality is transmitted by resistant parents to their offspring. Two such parents, a male and a female, have given excellent results, and their progeny will be produced in large quantities for distribution.

241 - How Thickly Should Seed be sown on Mountain Farms?

WILLNER, M. Wie stark soll der Gebirgsbauer säen? — *Zentralblatt für Landwirtschaft*. Year 93, No. 2, pp. 14-18. Brünn, January 16, 1913.

In 1911 and 1912, the writer made experiments on the two farms of Lessonitz and Watzanowitz in the south-west mountainous district of Moravia as to the best amount of cereal seed to sow; the results have been given by him in a series of tables. The estates are situated at 1500 to 2000 feet above sea-level; the soil is chiefly a somewhat sandy loam or loamy sand. Its content in nutritive matter is: nitrogen, 0.13 per cent.; phosphoric acid, 0.07 per cent.; potash, 0.35 per cent.; and lime, 0.3 per cent.; thus, except for the deficiency in phosphoric acid, it may be considered sufficiently rich to ensure good crops in favourable seasons.

I. *Wheat*. — In the year of drought 1911, the highest total and production was obtained on both farms by sowing the largest amount of seed. At Lessonitz 225 lbs. of seed produced 32.2 bushels of grain and 36 cwt. of straw per acre; at Watzanowitz, with 170 lbs. of seed, the yield was 34.4 bushels of grain and 36 3/4 cwt. of straw. At Lessonitz Strube's Schlanstedter Squarehead was grown and at Watzanowitz, Strubitz Squarehead.

In the wet year 1912, the maximum production was also obtained at Lessonitz by sowing the largest amount of seed, 202 lbs. per acre, 43.1 bushels gross yield per acre, which corresponds (subtracting seed) to 39.7 bushels net yield. The net yield of the next plot, which was sown with 170 lbs. of seed, was only a little less, viz. 39.1 bushels. At Watzanowitz, the experiments of 1912 gave less concordant results: maximum yield of grain (49.6 bu.) was obtained by sowing 193 lbs. of seed; after this come the net yields of 48.0 and 44.6 bushels, respectively from the sowing of 200 and 180 lbs. of seed. On both farms Strube's Schlanstedter Squarehead was the variety grown.

II. *Rye*. — The variety sown on both farms was Von Loch Petkuser. In 1911, the highest yield on both farms was obtained with the largest quantity of seed (at Lessonitz 196 lbs., at Watzanowitz 160 lbs.) but at Lessonitz nearly the same net yield of grain was obtained with 160 lbs. as with 196 lbs. (28.7 and 28.9 bushels respectively). The net yield increased with the increase of the seed sown also in the wet season of 1912, but the maximum crop was obtained with 160 to 196 lbs. of seed.

III. *Barley*. — In 1911, the barley (Melon) also yielded the maximum crop (48.1 bushels) when sown thickest (191 lbs.). But in 1912 the largest net yield of barley was obtained at Lessonitz from

per acre. In the experiment at Watzanowitz (with Moravian the yields obtained by sowing from 93 to 218 lbs. showed very differences.

Oats. — In the experiment carried out in 1911 on both farms Ligowo oats, the highest yields were obtained from the largest quantity of seed, viz. at Lessonitz 68.9 bushels from 160 lbs. and at Watzanowitz 58.8 bushels from 156 lbs. In 1912, the crops on both estates rose in amount of seed sown. The largest yields of 54.4 bushels (Ligowo) and 45.5 bushels (Petkuser Yellow) were obtained by sowing from 160 to 218 lbs. of seed.

The writer considers that these experiments clearly show that, under the best conditions, in the case of rye, barley and oats the best crop is obtained with from 160 to 180 lbs. of seed per acre; for wheat, especially the Squarehead type, at least 180 lbs. must be sown to get the best net yield.

Noltch's Imperial Barley cultivated in Hungary.

UDLER KÁROLY. Milyen árpat termeljen az alföldi gazda? — *Mezőgazdasági Szemle*, 1913, No. 1, pp. 35-37. Budapest, January 1913.

The writer, assistant to the Agricultural Station of Magyaróvár, shows that the variety of barley "Noltch's Imperial," so called after its first origin in Bohemia, M. Joseph Noltch, has proved to be most resistant to unfavourable weather. This variety was imported ten years ago to the Agricultural Station of Magyaróvár. It was distinguished at once by its early maturity and for the high yields which it can give.

The best results were those obtained in the fields of the Arad estate:

	Date of maturity			Yield per acre		
	1903	1904	1905	1903 lbs.	1904 lbs.	1905 lbs.
from Kwassitz	12.VII	12.VII	10.VII	1 063	960	667
" Vodiccka.	"	"	—	1 095	1 096	—
ch's Imperial. . .	"	"	8.VII	1 122	1 380	675
" Hanna.	"	"	9.VII	1 075	975	483

These results and others quoted by the writer show the superiority of Noltch's Imperial over the other varieties. In heavy clay soils it is sown always fully, whilst Hanna often produced grain only fit for seed to stock. Consequently Noltch's Imperial is a favourite with farmers and always more extensively cultivated by the small Hungarian farmers. The weight per bushel is often 56.9 lbs.; last year it was 56.9 lbs. and the gross yield per acre was 1260 lbs.

The writer has conducted experiments with 8 varieties, and up to the present Noltch's Imperial has always been the most successful, whence it concludes that in heavy soils it will always be successful, whence it concludes that in heavy soils it will always be successful, whence it concludes that in heavy soils it will always be successful.

243 - Cultivation Experiments with Spring Barley.

STRÖMMER, K. Anbauversuche mit Samengerste. Mitteilung der Anstalt für Pflanzenerkrankungen in Stettin. — *Deutsche Landwirtschaftliche Presse*, Year XXXX, No. 5, pp. 47-48, 1913, January 15, 1913.

For the last five years barley has been grown at Warsaw in the following rotation: 1) peas or beans; 2) winter wheat; 3) oats; 4) potatoes dunged; 5) barley; 6) winter rye; 7) beets dunged; 8) winter wheat. Considering the favourable conditions left by the previous crop, barley has hitherto been manured only with $3\frac{1}{4}$ cwt. of lime and $3\frac{1}{4}$ cwt. of basic slag per acre.

The averages for the varieties grown from 1908 to 1911 were as follows:

	bushels (1) per acre
Svalöf Princess	47.1
Svalöf Hannchen	45.9
Original Hanna (from Kwassitz)	44.6
Himmel's Golden Melon	43.2
Lerchenborger	43.1
Svalöf Imperial Primus	38.0
Magdalenen Chevalier (West Prussian)	37.7
Heydenreich's Goldthorpe	30.7

In 1912 barley-growing trials were made at Warsaw on good soil at Stargard on medium soils, at Köslin on light soils, and at two other places in the province. The wet weather increased the danger of lodging and offered a good opportunity for judging the resistance to lodging of the several varieties. In this respect the Chevalier failed most and thus occupy the lowest position both in yield of grain and in thousand-grain weight; Ackermann's Lower Bavarian also behaved a good deal. Imperial barleys behaved very well as regards resistance to lodging, but in yield of grain they were only average crops. Grain weight is in these kinds very high, and in the case of Nolt's Imperial it was the highest of all kinds grown. The best yields were obtained again, as in all the other experiments, from the barleys of the country. As winner Heil's Franken H 1 is to be mentioned; due to its resistance to lodging and to the fine development of its ear an extraordinarily heavy yield of 69.8 bushels per acre was reached. Svalöf Hannchen again took the second place, but its 1000-grain weight was not satisfactory; in yield Rimpau's Hanna was almost equal to it. The highest 1000-grain weight was attained by Heine's Hanna: 48 grams. Svalöf Princess failed completely this year, probably on account of the cold dry weather in spring. East Prussian Small Four-rowed barley gave the lowest yield; it is valuable only as a forage crop under special conditions, as it stands very late sowing, has a short period of vegetative growth and thrives on the lightest soils.

(1) Calculated from the grain weight.

Rice Growing in Louisiana.

(Hohensolms, La). Die Zuckerrohr-, Baumwoll- und Reiskultur in Louisiana (1).—*Openpflanzer*, Year 16, No. 12, pp. 633-645 + fig. Berlin, December 1912.

Rice Production in the United States.

State	Area under rice 1910 — acres	Rice crop 1911 — bushels *
North Carolina	1 000	27 000
South Carolina	17 000	357 000
Georgia	4 000	88 000
Florida	900	19 000
Alabama	1 000	25 000
Mississippi	2 800	84 000
Louisiana	371 200	12 769 000
Texas	264 800	8 738 000
Arkansas	60 000	2 400 000
California	100	3 000

* at 45 lbs. of unhulled rice.

Rice cultivation was begun in Louisiana on the alluvial soil of the Mississippi and its tributaries. The water is conveyed over the fields directly into the supply-trenches, or more usually pumped into special basins, whence it is brought over the levees by siphons. The use of siphons has this advantage: as long as the basins overflow during periods of high water, the apparatus acts automatically and the expenditure which is always great, is thereby diminished.

The chief hindrance to rice-growing is the impossibility of replacing manual labour by machinery; this is due to the fact that the land is washed away rapidly from the river towards the swamps, which makes it very difficult to throw up numerous flood dykes; and further, unfavourable conditions of the soil and of the period of flood hinder the complete drying of the fields.

About thirty years ago, rice-growing was attempted with great success on the prairie land of South-West Louisiana; this region produced one-tenth of the United States rice crop in 1911 (which was 506 million bushels). Naturally, the rainfall did not supply sufficient water for irrigation, and canals were made (730 miles long in 1911) for the conveyance of the necessary supply. Of late, this water has been paid for by a certain percentage, about one-fifth, of the crop. Districts which are at too great a distance from the canals can obtain water by boring down to a water-bearing stratum of gravel, which occurs at a depth of 150 to 300 ft. A pipe of 8 to 10 inch diameter usually supplies sufficient water for the irrigation of about 80 to 100 acres.

For the articles on cotton and sugar cane, see Nos. 1000 to 4000, *Basal* Feb. 1913. (Ed.)

Varieties. — "Upland" rice is little cultivated; it is only for local consumption and as a poultry feed. It grows on heavy soil, but on such light soils as are low-lying and damp. After the ground has been prepared, the rice is sown in rows about 2 ft. apart. The soil has been kept sufficiently wet and the growth of weeds checked. Work in the field ceases with the appearance of the ears. Harvest takes place in April or the beginning of September. The varieties chiefly cultivated are the Honduras and Japanese rice.

"Lowland" rice is the one usually grown in Louisiana; this is of the same type as the "Upland" variety. The cultivation of the Honduras rice has fallen off much of late, for red rice (*Oryza sativa* var. *rubra*) often makes its appearance amongst it. The latter was a cross between the two varieties and the hybrids showed further mutations. The Honduras rice is less resistant to disease than the foreign varieties. Some years ago a Rice-Growing Experiment Station was established at Crowley, Louisiana, especially engaged in the selection of disease-resisting and hard-grained varieties; some of the varieties at present grown give on polishing 90 per cent. of broken grains.

Honduras rice only is grown in the alluvial district, while the Japanese variety is cultivated on the prairie. The former grows the more luxuriant but is more prone to lodging than the latter; it ripens earlier than the Japanese rice and thus fetches higher prices. It is therefore becoming the custom in the prairies to plant both varieties in order to benefit by the maturity of the one and to increase the length of harvest time.

Preparation of the soil. — The soil may be worked either dry or wet. In the former case it is ploughed in winter or early spring, and well broken up with the disc harrow in the case of heavy soil with clods; but when the soil is lighter the rotating toothed-harrow is used. If the soil is very heavy to work (as on the prairie after fallow) the fields are irrigated, ploughed and sown immediately afterwards. Ploughing in alluvial land is 2 inches deep the first year, getting gradually deeper each succeeding year. On the prairie some plough 6 inches, others only 3, as they reckon that the extra ploughing makes harvesting heavier owing to the machine sinking into the ground.

The necessary dykes are thrown up by plough, mattock or scythe, owing to the sharp fall of the alluvial land towards the swamps, the dykes cannot be large and are often only 1 ½ to 2 acres, rarely 3 or 4, although on the prairie they are larger.

Sowing. — In the alluvial district, sowing is usually done in March or early April, with a broad-casting machine; 45 to 65 lbs. of seed are used per acre, and it is purchased fresh every year.

On the prairie, the Japanese rice is sown from early April to the middle of June, while the Honduras variety is put in as early as possible. The seed is usually drilled, which saves seed (40 to 50 lbs. being used per acre) and gives a heavier crop.

In wet years the rice is sown in late April or early May, and when the water is high the soil is prepared by means of mules drawing plant

of branches. When the mud has settled over the seed, the excess must be drained off.

In normal seasons the rice is tall enough to allow of the field being in five weeks, but in dry years it takes longer, sometimes even twice as long, to grow the required amount; recourse is then had to temporary irrigation. The field must be flooded without delay if weeds threaten to ruin the crop; sometimes it is necessary to mow the whole field to the surface of the soil, and to irrigate at once; the rice sprouts again, but the seedlings remain below the water and perish.

Irrigation is carried out in such a manner that the water flows on from field to the others. In the alluvial district, the depth of water varies from 12 inches; in the highest parts of the prairie it is only an inch or in the lowest from 4 ½ to 7 inches. The writer does not advise irrigation deeper than 4 inches, as too much water promotes lodging and destroys the crop.

The worst weed in rice-fields is red rice (*Oryza sativa* var. *rufipogon*); others are *Sesbania macrocarpa* Muhl. and *Aeschynomene virginica*, the last especially in the alluvial district. Weeding is done by hand; this work is usually performed by the negroes, adults being paid 80 or 90 cents and children 40 cents.

As soon as the rice begins to turn yellow and the ears to droop, the crop is drawn off. A fortnight later, the crop is ripe for harvest; this is the case for the Japanese rice in the alluvial district in the middle of July and for the prairie at the beginning of August. The Honduras variety ripens earlier.

Harvesting. — In the alluvial district, the rice is cut with a sickle; the straw is left standing till the rice dries. When cut, the rice is made up into sheaves and placed in heaps, where it remains till it is threshed. On the prairie, binders are used; the writer recommends those made by Cavaliere and Bertone (Turin), of which he gives a description.

Threshing is effected as soon as possible, so as to prevent damage by weather. Sometimes stacks are made of the size of a waggon-load; this means the rice heats; as soon as the temperature has reached its maximum, it gradually falls and the stack dries, as does the grain, which becomes very hard and on husking is very white and brilliant. The rice is, however, not usually stacked to improve the quality of the grain, but out of necessity, when no threshing machine can be got, or if bad weather prevents. In such cases the stack is often built on a wooden platform.

Yield. — The average crop is 10 to 20 sacks of 162 lbs. of unhusked rice per acre, minimum 6 sacks, maximum 27 sacks. In 1911, there were 100 mills in Louisiana. The straw is used sometimes as forage, otherwise it is left on the field, or burnt.

In rainy seasons, the rice stubble soon sprouts again and is cut green, which makes a valuable feed; if the harvest has been bad, however, this second crop may also be allowed to ripen and it amounts to about one-third of the normal first harvest.

Basalak
1000 to 4000

Rice is seldom grown more than four years in succession on the same field. When aquatic weeds get very bad, the field may be left fallow two or three years. Fertilizers are practically not used.

Enemies of rice. — Rice mildew (*Pyricularia oryza* Bri. and C.) occurs chiefly in the south-west of Louisiana, where it causes a loss of 5 to 25 per cent. of the crop. There are no efficacious means of controlling this fungus. The most resistant varieties are Honduras and Japanese.

Obolus pugnax Fabr. and other insects of the same family (Pentatomidae) bore into the grains and extract the juice. The wounds are good points of attack for fungi and bacteria, which develop and form black patches. The loss occasioned is from 10 to 25 per cent. No good remedy against these enemies is known. Japanese rice suffers more than does Honduras variety.

Rice-birds (*Dolichonyx oryzivorus*) also do great damage in places

245 — *Phaseolus lunatus* Beans.

Bulletin of the Imperial Institute, Vol. X, No. 4, pp. 653-655. London, December 1911.

A death which recently occurred on the Dankanda Estate, Mat Ceylon, through eating the beans of *Phaseolus lunatus*, which bear local names of *Veli Bonchi* (Tamil) and *Potu Dambala* (Sinhalese), point to the warnings that have been repeatedly published during the last ten years as to the dangerous nature of the beans produced by certain varieties of *P. lunatus*. The following four kinds of these beans are known:

1. Medium-sized, rather flat, somewhat shrivelled beans, varying in colour from dull purplish-red to nearly black. This kind is represented by the "Java beans", which were imported some years ago from various European countries, and caused numerous cases of poisoning among cattle fed with them (1). These beans yield comparatively large quantities of prussic acid when ground and moistened with water. This variety is only fit for use as a green manure.

2. Small reddish beans, which are usually plump and occasionally show purple spots. This variety is represented by the "red Rangoon" or "red Burma" beans, which are largely exported from India. When ground and mixed with water they yield minute and usually but small amounts of prussic acid. So far as is known, no poisoning case has arisen from their use.

3. Small white beans, usually plump. "White Rangoon" or "White Burma" beans belong to this kind. They generally yield mere traces of prussic acid.

4. Large plump white beans. This variety is represented by the "white beans", which are largely cultivated in the United States, Southern Europe, Madagascar and elsewhere for use as a vegetable. Numerous samples of this kind have been analyzed; and only a few yielded

(1) See *Natural History*, 1911; No. 792, B. May 1912.

of prussic acid, most of them showing none at all. This variety is perfectly safe for use as a human foodstuff, though wherever grown for the first time samples from the first few crops should be taken in order to ensure that no deterioration to a less desirable variety occurred.

Recent statements in the Indian Press express a fear that the export of mung beans is doomed to extinction. The writer notes that the trade of these beans is still flourishing, notwithstanding the fact of the discovery of the poisonous nature of some of these beans was made at the Imperial Institute as long ago as 1903.

These beans are regarded with some suspicion by experts and they fetch comparatively small prices in the market. In view of this, the Imperial Institute has recently suggested to the Department of Agriculture in Burma that steps might be taken to encourage the natives to produce a better class of beans for export, and samples of the kinds which would be required have been forwarded for trial cultivation.

Yam Growing in Jamaica and in Queensland.

ROSEVILLE, R. C. Yam Growing in Hanover. — *The Journal of the Jamaica Agricultural Society*, Vol. XIV, No. 12, pp. 648-650. Kingston, December 1912.

Growing Yams. — *The Queensland Agricultural Journal*, Vol. XXX, Part 1, pp. 45-46. Brisbane, January 1913.

Yam Growing in Hanover, Jamaica. — The yam tuber takes the first place of all the vegetable foods grown in Jamaica in the diet of the labouring classes. In every parish it is grown to a greater or less extent, but the methods of planting and cultivating differ considerably in the various districts. The most important yam-growing centre is Hanover, which produces the Lucea yam or, as it is called in Hanover, "Dick". This variety thrives best in Hanover, although it gives satisfactory results in Upper St. James, Westmoreland and some parts of St. Andrew.

The plants are spiny; the tubers are white when cooked and of regular shape; they keep well, pack easily and are resistant to transport. In Hanover the yam fields are situated on the slopes of the mountains which are too steep for bananas. The hills are dug very close together, 2000 to the acre. Two "bits" (extremities of the tubers), with an eye, are planted in each hill. The Doctor Dick requires support for support. A good worker can dig 150 hills per day. The yield per acre is about 4 tons, but under very favourable conditions as much as 6 tons can be harvested.

The cost of cultivating one acre of yams is the following:

	£	s	d
Rent	1	0	0
Cutting and cleaning	2	0	0
Digging 2000 yam hills including planting	2	10	0
2000 sticks	1	0	0
Sticking out yams		10	0
Two weedings	1	0	0
Total cost . . .	8	0	0
Carriage to the port of Lucea .	4	0	0
Total cost of the produce of one acre of yams at the port .	12	0	0

The yams are sold in Lucea at £8 per ton, bringing in a gross of £32.

The cost of buying plants is left out as that once done the yam will always have enough to plant.

It has been calculated that the yam industry means an income of £40 000 annually to Hanover.

Another variety of yam is also cultivated in Hanover; The "A" or yellow yam; it is a great favourite in the local markets, but it does not keep long and is therefore useless for foreign trade.

It is planted even closer than Doctor Dick and requires short st

2. *Yam growing in Queensland, Australia.* — In the early days, some thousands of kanakas were employed in the Queensland sugar plantations, yams were largely grown, as they formed part of the labor rations. Since black labour ceased in the State, the cultivation of yam has fallen off. The tuber, perhaps owing to its glutinous nature is not much appreciated by the white population. The yam requires warm damp climate to be produced to perfection, but it thrives in conditions where the sweet potato would not do so. It is propagated by setts from the roots, or by small bulbs which are planted in rows 3 feet apart, the setts being at the same distance from each other. The planting season is September, and the crop will be ready in from 6 to 8 months. After planting a stout stake is set near each sett. The Papuan natives, who grow large quantities of yams, often lay sticks over the setts and allow the vines to run over them, thus giving the plants air and preventing a luxuriant growth of weeds. The after culture is trifling and consists in weeding and loosening the soil; and when Dutch hoes are used, the cultivator can be run between the rows, and the weeds can be destroyed close up to the plant.

The best known edible kinds are *Dioscorea bulbifera*, *D. aculeata*, Guinea yam, and *D. alata*, the last being the kind most highly esteemed in India. The winged *D. alata* attains a length of 3 feet. *D. alata* is the most productive. The Cush-Cush Yam (*D.*

called in Jamaica the Indian Yam, and in British Guiana it is the Buck Yam. The tubers are roundish and rarely exceed in length and 3 in. in diameter. It is the smallest and most of all the yams. The plant is prolific, sometimes bearing a dozen the roots.

New Variety of Rye Grass.

Journal of the New Zealand Department of Agriculture, Vol. 5, No. 5, pp. 484-486. 1912, N. Z., November 1912.

Western Wolths Grass is a variety of Italian rye grass said to be originated from a plant plucked from the roadside by a Dutch peasant. It is characterised by its extremely rapid and vigorous growth, and in the past season, at the Ruakura Farm of Instruction, yielded 10 tons of forage per acre at the first cutting. It has proved excellent for dairy cattle and provides several good subsequent cuttings. It is indistinguishable from ordinary Italian rye grass, and buyers should be careful to purchase seed guaranteed true to type.

Cotton Industry of Nyasaland.

Journal of the Imperial Institute, Vol X, No. 4, pp. 527-536. London, December 1912.

The introduction of cotton growing into Nyasaland is of comparatively recent occurrence, a few consignments being exported for the first time in 1902; but already a large industry has been worked up, the rapid growth of which may be judged from the following table:

Years	Quantity lbs.	Value £
1902-1903.	692	No complete returns
1903-1904.	58 897	1 778
1904-1905.	285 185	5 941
1905-1906.	776 640	16 180
1906-1907.	526 119	15 345
1907-1908.	403 486	13 998
1908-1909.	756 120	28 355
1909-1910.	858 926	26 209
1910-1911.	1 736 999	58 687

In the early days of the industry all kinds of cotton were grown, but most of these were unsuited to the climatic conditions of the Province. And owing to the different varieties being grown in proximity to one another, cross-fertilisation was common, resulting in the deterioration of those types which, under proper conditions, would have given good results. The only cottons now grown on a commercial scale are Egyptian varieties which are adapted to the warmer districts of the Lower river, and long-stapled Upland forms, which are cultivated only on the higher lands. Generally, the Egyptian cottons are grown in Nyasaland at elevations of 1000 ft., and the American kinds from 2000 to 4000 ft.

By careful selection of "improved" American Upland variety type of cotton has been evolved which has now become acclimated and is recognised as a distinct commercial variety under the name of "Nyasaland". At the present time this cotton is regarded as the best in Nyasaland from Upland seed. Of the total area under European cultivation in the Protectorate in 1912, 23 000 acres were devoted to land Upland and 755 acres to Egyptian cotton.

Accounts of the cotton industry in Nyasaland and of the experiments with Nyasaland Upland cotton have been given in the *Bulletin of the Imperial Institute* of 1909, 1910, 1911 and 1912. A summary of the results of the examination of cotton samples from Nyasaland published in a *Report on British Cotton Cultivation* (No. 50, *Cotton Exports, Miscellaneous Series* [Cd. 3997] 1908).

The article under review refers to the results of the examination of the samples received in the last few years and belonging to the "Nyasaland Upland", Egyptian (Mitafifi, Abassi, Nubari) and other varieties.

249 - Ramie.

DEWEY, Lyster H. — *U. S. Department of Agriculture, Bureau of Plant Industry Circular* No. 103, pp. 9 + 2 figs. Washington, December 27, 1912.

Experiments in the cultivation of ramie have been carried on in the United States since 1860. Although none of them so far has led to a commercial industry, several kinds of ramie goods are appearing in increasing quantities in the American markets. Some mills are engaged in the manufacture of these goods and others are being engaged for the work.

Ramie is cultivated commercially in China, in Japan, in Taiwan (Formosa), in Chosen (Korea), and to a limited extent in India and Africa.

Numerous experiments have demonstrated that it can be grown on suitable soils from Maryland to Texas; also in California and Portugal.

A warm, moist climate is essential for the successful cultivation of ramie: warm temperate climates rather than the tropics. Unless under irrigation or on moist bottom lands it requires at least 40 inches of well-distributed rainfall. It requires a rich, deep, moist soil, well drained, yet not subject to drought. The following data were obtained by Prof. E. W. Hilgard at the California Agricultural Experiment Station.

Ramie is propagated by root cuttings or by seeds; in the latter case they grow more quickly and with more certainty. The seedlings must be covered with a cloth to keep the atmosphere warm and moist and rated with moisture. When 6 to 10 weeks old the seedlings are transplanted to a nursery, and two months later they may be transplanted to the open field at 20 to 30 inches apart in rows 3 to 4 feet apart. Land between the rows must be cultivated. If irrigated, the irrigation system must be used to avoid covering the young plants with

Ingredients (in pounds) withdrawn from 1 acre by a crop of ramie.

Ingredients	Leaves (8 500 lbs.)	Stalks (14 500 lbs.)	Bark (5 500 lbs.)	Whole plant (28 500 lbs.)
...	68.13	155.99	27.86	251.98
...	8.90	33.63	7.52	50.14
...	566.91	71.77	19.14	657.82
...	114.58	43.68	10.01	168.27
oxide	1.92	1.45	0.20	3.57
ide and alumina .	38.56	12.16	0.71	51.43
ic acid	77.13	67.71	10.86	155.70
acid	30.86	14.53	3.17	48.56
...	692.71	7.06	4.48	704.25
...	41.56	2.50	7.79	51.85
constituents . . .	1 641.35	410.85	91.74	2 133.57
...	206.10	105.85	57.75	369.70

The first stalks of ramie are usually much branched and of no

It is best to cut off the first shoots when they are 10 to 30 inches high to induce a thicker and more uniform growth of shoots. In Asia one to four, usually two, crops are cut each year. In Asia stalk is cut as it matures, leaving the younger stalks to grow. If ramie is to be decorticated green it must be stripped immediately being cut; if the operation is to be carried out when dry the should be cured in the swath or gavel and care must be exercised and heating or molding. The strips of bark with the fibre are "ramie ribbons". The hand-cleaned fibre free from the bark pulp is called "China grass". The fibre in order to be spun is treated by chemical processes and then combed to remove the short or "noils" from the long ones or "tops". Both tops and are spun.

The yield of stalks usually increases up to the fourth year. The following data are based on numerous experiments made in France:

Yield of ramie stalks and fibre in pounds per acre.

Year	Green stalks	Air-dry stalks	Dry fibre
First	6 000	1 500	300
Second	12 000	3 000	600
Third	18 400	4 600	900
Fourth	26 400	6 600	1 300

The production of raw fibre from two annual cuttings in experimental plantings ranges from 500 to 2800 lb. with an average (different authorities) of 1293 lb. The yield of dry fibre is 3 to 5 per cent of the weight of the green stalks, or 15 to 20 per cent. of the air-dry stalks. In Formosa, where three or four crops are harvested each year over about 5000 acres, the average annual yield is about 700 lb. per acre. In Hunan, and Hupeh, China, the annual yield is 400 to 600 lb. of China grass per acre from three crops.

The ramie fibre, cleaned by hand in China, can be delivered in San Francisco or New York at 6 to 10 cents (about 3d. to 5d.) per pound. It is roughly estimated that the importations of China grass into the United States now amount to nearly 1 000 000 lb. annually, besides considerable quantities of yarns and some degummed filasse from Hongkong is the principal shipping port for the fibre.

The cultivation of ramie is limited to the countries having a plentiful supply of skilled hand labour; this is chiefly due to the lack of satisfactory mechanical methods for separating the fibre. Recently some European firms have put on the market some machines for this purpose, and a very promising work was done in trials with a machine built in the United States to decorticate ramie fibre from the dry stalks. Fibre decorticated from green stalks is desired for most degumming processes, and machines are now being perfected for this work.

The outlook for the ramie industry in the United States appears promising. The question, however, remains whether this fibre can be produced at a cost permitting it to compete with the Chinese fibre.

250 - The Cultivation of Sisal Hemp in German East Africa.

Die Sisalkultur in Deutsch-Ost-Afrika. — *Verhandlungen des Vorstandes des Kolonialwirtschaftlichen Komitees*, No. 2, pp. 39-48. Berlin, December 5, 1912.

This paper is the result of a journey of investigation undertaken by Dr. W. F. Bruck.

Importance of the Cultivation. The cultivation of *Agave sisalana* (Sisal Hemp) in German East Africa, where it has been introduced

the last twenty years, has already proved to have a sure future, and to be specially suitable to the country. In 1911, 11,935 tons of fibre worth £220 000 were exported from the Protectorate. For the exportation of at least 16 240 tons was reckoned upon, at a price of £34 17s 6d per ton for the best quality, and it is calculated that the yearly export will soon attain 20 000 tons, worth about £500 000.

— *Agave sisalana* thrives in German East Africa under the various conditions of soil and of climate: on the fertile soils of the high mountains; on the red loams produced by the disintegration of the coral rocks; on the calcareous soils of the coast, sometimes also red and from the disintegration of coral rocks; and on the typical steppe (Kilossa). As for the quality and quantity of the fibre produced, the results are those obtained on medium and poor soils.

Cultivation. — *Agave sisalana* is important in German East Africa as a cultivated plant. It is generally propagated by means of suckers, about 20 inches long and which develop better the older they are; they are generally planted out at once, being rarely put into a pot.

In soils that are not too rich the first cut may be made after three years. As a rule cropping goes on for five to seven years; a planter usually keeps the plants about ten years. This holds true for medium soils; in the light soils the crop begins earlier; thus, in the Usambara district the first cut may be made eighteen months after planting, but the plant is exhausted after three years. In very poor soils, for instance on limestone or rocky soil, the first crop is secured only 4 or 5 years after planting, but the plants live much longer.

With careful cultivation the suckers which form around the base of the plants are removed; in neglected or "wild" plantations, as the natives call them, they are allowed to grow. With the latter system the crop of leaves is heavier but they and the fibre they yield lack uniformity. Besides, it hinders the removal of weeds, which overrun the ground and very probably favour the actions of fungus and other parasites. Careless cultivation, it is believed, can also lead to the degeneration of the *Agave*. In Java the species is already partially degenerated. The writer recommends regular cultivation at certain distances between the plants and with systematic weedings.

When other plants are not grown between the rows the agaves should be spaced 4 ft. to 7 ½ ft. apart, according to the soil. For planting in the rows cotton has often been adopted; in particularly suitable cases this has given good results, defraying a good deal of the cost of clearing and working before the principal crop began to bear. But there is no certainty of a rainy and a dry season, mixed plantations are not advisable. As normally sisal hemp does not yield such profits as other tropical crops, and as on the other hand the Colony lacks virgin soils, the writer advises, for the present, the extension rather than the intensive cultivation of the plant.

For the improvement of exhausted lands, Leguminosae might be planted between the rows or fallowing resorted to.

Production and economic considerations. — As a rule each should give 200 leaves suitable for the extraction of fibre, which amount to 3.5 or 4 per cent. of the leaves and be of good quality. Krupp scutching machine works satisfactorily.

In making an agave plantation the estimates must be based on production capable of supplying sufficient material to keep one or two scutching machines uninterruptedly going, calculating on 100 000 to 200 000 leaves per day per machine for 300 days per annum.

The Colony disposes of land suitable for a further extension of cultivation, but this is checked by the want of labour. There is at present an excess of production, as with prices at £22 to £27 7s 6d per ton sisal hemp is a very profitable crop in places systematically cultivated. Besides, if the example of Mexico were followed—where sisal has been cultivated for the last forty years—at wax, oxalic acid, compressed fuel and paper could be prepared from by-products remaining after the extraction of the fibre.

251 - The Hemp Industry.

FERRIS, W. H. in *The Journal of the New Zealand Department of Agriculture*, No. 5, pp. 516-517. Wellington, N. Z., November 1912.

The production of *Phormium tenax* is diminishing in importance in the Auckland district. With better drainage of the great northern swamp it was expected that the production of fibre would expand, but with development of drainage the swamp lands are proving valuable for cultural purposes and the *Phormium* plant is gradually disappearing. It is still produced to a considerable extent in the Tawa Swamp (between Te Awamutu and Te Kuiti) and in the swamps on the east coast; generally there is small chance of fibre extraction proving a stable industry in the north of New Zealand. Auckland *Phormium* is practically unaffected by disease, but it is inferior to the southern leaf. It is irregular in length, while the fibre is not so strong.

On the other hand, in the northern Manawatu, *Phormium* occupies about 15 000 acres of land in one solid block, which it will occupy until means have been devised to prevent its periodic flooding by the Manawatu River. The huge quantities of leaf surrounding the mills enable the cost of production to be reduced to a minimum and afford mill labour a guarantee of employment, thus providing better qualified labour and encouraging millers to erect up-to-date mills.

Considerable activity in the fibre industry is being displayed in the south of New Zealand. In several cases mills are being equipped with the latest labour-saving machinery. The installation of the automatic washing-machine has considerably improved the colour of the fibre and effects a saving of time.

"Assa-peixe" of Brazil: Substitute for Hemp.

ORAES, PASCHOAL. Um precioso succedaneo do Canhamo, etc. — *Chacaras e Quin-*
ol. VI, No. 6, p. 12. São Paulo, Brazil, December 1912.

plant, which grows wild in Brazil, where it is known as "Assa-peixe"; it appears to be *Boehmeria caudata* Swartz; it grows in abundance north of Brazil, covering extensive areas; its stem frequently reaches the height of 6 feet and is used in Bahia for trifling purposes; the fibre, which for its tenacity and abundance would deserve to be better neglected. "Assa-peixe" is a very hardy plant, having very few wants in the matters of the nature of the soil, quantity of cultivation and manuring.

General Review of the Beet Sugar Industry in the United States.

W. B.: U. S. Department of Agriculture, Bureau of Plant Industry, Bulletin 50, pp. 15-30. Washington, November 1912.

In a consideration of results obtained in Europe, the most favourable conditions for the growth of sugar beets in the United States were found to lie on either side of the summer isothermal line of 70°F., and at present time the industry has developed in three main localities within this area:

1. *The Californian Region*, in southern and central California.

2. *The Intermountain Region*, chiefly in Colorado, Utah and Idaho.

3. *The Great Lakes Region*, in Michigan and Wisconsin, with the western parts of Ohio, Indiana and Illinois.

Besides these there are a few scattered factories, some of which give promise of considerable future growth.

The rainfall varies widely within these regions. It ranges from under 10 in. per annum in the semi-arid parts of the Intermountain Region, where beets can only be raised with irrigation, to 30 or 35 in. in the humid climates of the Great Lakes Region. The length of the growing season, excluding subtropical districts of California and Arizona, varies from 90 to 170 days. The cost of growing an acre of sugar beets is computed from \$32 (£6 11s 6d) to \$43 (£8 16s 9d), excluding the rent of land, and the yields vary from 8 to 13 short tons (7 to 11½ English tons) per acre. With regard to the by-products: the tops are utilized by feeding them green in the field, and their market value is reckoned at \$4 (8s to 16s 6d) per acre; the exhausted pulp is sold as cattle feed either in a wet, fermented state, worth 25 to 35 cents per ton, or to 15s 7d per ton, or in a dried condition at about \$15 a ton, (per ton); molasses are produced only in small amounts and sell for about \$10 a ton (45s per ton.); lastly, the lime and waste water are of no use at any economic use at present.

During the last 25 years the home-grown beet-sugar crop has risen from nothing to one-eighth of the total home consumption — the acreage planted in 1911 being little less than 475,000 acres. It is estimated that less than 1 per cent. of the improved land in the States in which it is known that sugar beets can be successfully grown were planted with

this crop, it would be unnecessary for the United States to buy foreign sugar.

254 - **Improvement in the Shape of Sugar Beets.**

SEVERIN, C. De l'Amélioration de la forme de la betterave à sucre. — *Journal d'Agriculture Pratique*, Vol. I, Nos. 1 and 2, pp. 11-12 and 48-50. Paris, January 1913.

Some experiments were undertaken in order to estimate the influence played by the shape of the root in the labour of harvesting the crop. The root was seized just below the crown by a clutch to which a dynamometer was attached; it was then pulled, and the work done in the operation was recorded. Each root was subsequently weighed.

The nature of the soil naturally has an important effect on the results obtained, but in the same field the long tapering beets or those with many or lateral roots gave a much higher figure than the short globular beets. When the results are reduced to traction in pounds per unit weight of the root, the average figures for the different varieties varied from 64.4 to 89.8 lbs. Analyses of these two extreme cases showed that the quality of the root was in no way connected with the shape; so that, with careful selection, it is reasonable to hope that varieties may be obtained which will considerably reduce the labour, and consequently the cost, of harvesting the crop.

255 - **The Insect Visitors of Beet and Mangold Flowers (1).**

UZEL, HEINRICH. Ueber die Insekten, welche die Blüten der Zucker- und Fenchel besuchen. — *Zeitschrift für Zuckerindustrie in Böhmen*, Year XXXVIII, Part 1, pp. 182-197 + 2 figs. Prague, January 1913.

Recalling the experiments of K. Andriik, V. Bartôš and J. Urban who demonstrated that beets possessing a high sugar content give rise to descendants with lower sugar content when they are crossed with beets containing less sugar or worse still with mangolds, the writer observes that the opinion that beet flowers are anemophilous is widely spread. While both direct observation and the structure of the flower and the pollen show that insects play a great part in the fertilisation of beets. In fact, the flowers have nectaries and they are scented; the pollen has a rough surface and is very sticky. There are species of insects which regularly visit beet and mangold flowers; they consequently render considerable service, even at great distances, possible. Such insects seek the nectar and subordinately pollen; some devour or suck the flowers and the other parts of the flower clusters; while others again prey upon the insect visitors. All come into contact with the pollen and all of them can carry it about.

In Bohemia, on the flowers and flower clusters of sugar beets the numbers of the following insects may be observed: in the first place

(1) See No. 1168, B. Aug. 1912.

(2) See No. 121, B. Jan. 1911.

(E4).

(E4).

communis * Uzel; then the flies: *Syrirta pipiens* * L., *Sarcophaga* * L. and *Ceratopogon bipunctatus* * L.; after which follow the beetles: *Lygus campestris* L., with its larvae, *Calocoris lineolatus* *Campylonomus verbaschi* H. Sch.; the Cicadid *Chlorita flavescens*; lastly the Coleoptera: *Sitona sulcifrons* Thunberg and *Apion* Herbst. The writer has observed in fairly considerable numbers sanoptera: *Physopus atrata* * Halid., *P. vulgarissima* * Halid. and *Physopus fasciata* * L.; the flies: *Melithreptus dispar* * Löw, *Polennia rudis* * Fab. and *Spilogaster quadrum* * Fab.; the Hemiptera: *Psylla nigra* Wolff; the Tenthredinid *Athalia spinarum* * Fab. and the Curculionid *Sminthurus luteus* Lubb.

The following are not frequent. Diptera: *Sciara pallipes* Fbr., *Scaticharia* Lw., *Oscinis pusilla* Mg., *Phorbia platyura* Mg.; Coleoptera: *Curculio chrysomelinus* L., *Sitona lineatus* L., *Apion seniculus* Kirb., *Phyllotreta* Herbst. and *Phyllotreta nigripes* Panz.

The following are rare. Coleoptera: *Stenus ater* Mannh., *Tachyporus* F., *Meligethes aeneus* F., *Sitona hispidulus* F., *S. humeralis*, *Apion varipes* Germ., *A. aestivatum* Germ. (= *trifolii* Bach); *Onesia sepulchralis* Mg., *Sarcophaga vagans* Mg., *Melanostoma* L., *Hylemyia cinerella* Mg., *Chlorops didyma* Ztt., *Phorbia humeralis flavimana* Ztt., *S. pulicaria* Mg., *Simulium maculata* Mg., *Simulium* L., *S. punctum* Fbr., *Clasiopa obscurula* Fall. and *Syrphoctonus* Deg.; lastly the bee *Halictus pauxillus* F., and species of the families Proctotrupidae and Chalcididae.

For mangold flowers, the writer has observed that in Bohemia the most visited with the greatest frequency by the flies: *Syrirta pipiens* * *Sarcophaga carnaria* * L., to a certain extent also by the flies: *Melithreptus dispar* * Löw, *Polennia rudis* * Fab. and *Spilogaster quadrum* * Fab. All these species often visit the flowers of sugar beets also. In mangold flowers in isolated cases the following flies have been observed: *Sarcophaga striata* Fab., *S. haematodes* Mg., *Exorista vulgaris* L., *Synomyia mortuorum* L., *Spilogaster duplicata* Mg. and *Hylemyia* Fab.

It follows a description and considerations on the life history of the insects which visit in great numbers the flowers of sugar beets, or on the flies themselves. Some of these insects visit mangolds also.

The following species are found in great numbers on the flowers of sugar beets; they suck the juices from the stem, the leaves and the flowers or devour these parts. Coleoptera: *Sitona sulcifrons* (especially injurious to young leguminous plants), *Apion virens*, *Phyllotreta vittula* Redt.; Hemiptera: *Lygus campestris* L. (often injurious to colza, rape, dill, parsnips, chrysanthemums and dahlias; it is observed that the allied species *L. pratensis* (1) causes notable damage

* The asterisks denote the species which are frequent in the flowers or on them.

(Authors' note.
(Ed.)

See No. 1381, B. Sept. 1912.

to sugar beets in North America); *Colocoris lineolatus* Goeze (sometimes especially injurious to hops and in a lesser degree to potatoes, cotton and ornamental plants); *Campylomma verbasci* H. Sch.; *Triphleps nuda* Wolff (observed by the author to chase Thysanoptera; in America Thysanoptera are preyed upon by *Triphleps insidiosus*); Cicadid *Chlorita flavescens* Fab.; the Podurid *Sminthurus luteus* Latr.

The writer lastly quotes the works he has consulted for the compilation of his paper.

256 - Baobab Oil.

REV H. Notice sur l'huile de Baobab. — *Bulletin Economique de Madagascar et dependances*, Year 12, No. 2, pp. 135-140. Tananarive, 2nd Half-year 1912.

The baobab (*Adansonia digitata* L.) presents in the Sakalava nabe country three varieties: "rainiala", "fony" and "zaha". The fruit of the first variety is oblong, covered when ripe with a thick brown down; that of the second is round, slightly velvety and dark green while the fruit of the third variety is long and ellipsoidal in shape, skin is thick, wrinkled and black when ripe.

These trees attain gigantic dimensions; "rainiala", the largest of all, ordinarily reaches a height of 40 to 50 feet, and the average circumference of its trunk is 20 to 23 feet. But these dimensions are frequently surpassed.

"Zaha" is the first to bloom, "fony" is the second and "rainiala" the third. The best time for gathering the "zaha" crop is first fortnight of September; for "fony" the second fortnight of October and for "rainiala" the month of November.

For the extraction of the oil the natives free the nuts from the husk which envelops them; they then crush them in a rice mortar and the compact mass thus obtained in a vessel and cover it with 8 to 10 inches of water. It is boiled over a brisk fire for the first half hour then gently for several hours. The oil begins to appear about two hours after the vessel has been placed over the fire, and about eight hours are required in order to obtain the maximum yield of oil.

Yield of fruit and seeds. — The following data give the average yield of each variety:

	Rainiala	Fony	Zaha
Number of fruits per tree	80	70	60
Average weight per fruit in oz.	10	7	7
Average number of seeds per fruit	95	100	75
Average weight of seeds in 100 fruits in lbs.	22	15	11
Average quantity of oil per 100 lbs. of seeds in gals.	1	0.6	0.5

It must be added that for the same variety the fruits are numerous and larger on the trees growing on rich soils, and that the use of European machinery for extracting the oil by means of press the amount of oil for the same weight of seeds may be quadrupled.

The above table shows the commercial superiority of "rainiala" the other two varieties for its greater number of fruit and more abundant yield of seeds and of oil. The "zaha" variety, notwithstanding its lower production and the difficulty of treating the fruit (owing to the thickness of its rind and to the dense fibrous network which encloses the seeds to the pulp) may nevertheless be taken into consideration for its oil, as the fructification of these three varieties extends over several weeks.

Chemical composition and industrial value of the oil. — M. Millian, Director of the Laboratory of the Colonial Garden, has studied Baobab seeds. The oily seed has the shape of a hazel nut encased in a resistant shell adhering to the pulp, which represents about 20 per cent. of the weight of the seed. In the centre there is a white pulp capable of yielding oil by pressure; the rest is a kind of flour without oil. These three constituents are found in the following proportion:

Oil	39.01 per cent.
Moisture	7.20 "
Shell and dry flour	53.78 "

Total 99.99

The seed does not contain any injurious product, so that the cake obtained by pressure might be used as food for live stock. The expressed oil has a fine yellow colour, its odour is pleasant; it solidifies at 25° and is especially rich in fatty acids solidifying at normal temperatures; the liquid part appears to be exclusively formed by oleic acid, and the solid part is a mixture of stearic and palmitic acids. The oil may be used for food or for the preparation of artificial butters and margarine, and it might take the place of olive oil in pharmaceutical preparations and in perfumery. It would be very suitable also for making fine soaps, stearin and lubricants.

Harvest and yield. — In order to gather the fruit the Sakalaves drive long poles into the trunk, situating them so as to form a ladder by means of which they reach the top of the tree; they then use poles to knock the fruit down.

The following table gives the yield in oil from a ton of seeds and cost according to the process used, viz the European or the native.

Variety	Native process		European process	
Rainiala	Maximum yield 22 gals.		Minimum yield 79.2 gal.	
	Average price per gal. 7s 2d		Average price per gal. 1s 6d	
	Max. yield 13.2 gal.		Min. yield 48.4 gal.	
	Average price per gal. 11s 8d		Average price per gal. 2s 5 1/2d	
Zaha	Max. yield 11 gal.		Min. yield 39.6 gal.	
	Average price per gal. 14s 5d		Average price per gal. 3s 0d	

Baobabs are found in abundance in the coastal belt. Trees of the same variety are frequently found in groups in the soils favourable to the development and then 6 or 8 per acre may be reckoned upon. The number of trees that can be worked now in Northern Menabe is estimated to be about 6000, which would yield for that region about 30 tons of oil seeds; by the European methods, these would produce about 100 gallons of oil.

257 - Tests of African Rubber.

BREUIL, PIERRE. Essais de caoutchouc d'Afrique. — *Le Caoutchouc et la Gutta Percha*. Year 10, No. 107, pp. 6884—6891. Paris, January 15, 1912.

This article gives the result of comparative tests of some samples of Funtumia rubber and the so-called "caoutchouc des herbes" (1) and Para Weak. As a test of the general value of rubbers, the writer took half the product of the tension strain resulting from the multiplication of this strain by the amount of elongation at the moment of rupture. He found that in Funtumia rubber vulcanised with 4.7 per cent. of sulphur, the pliability diminishes with the increase of the time of vulcanization, its "cyclic fatigue" increases (2), as do its resistance to rupture and its stretching, and its permanent elongation. After being boiled for 10 minutes at 143° C. it is 1½ times more supple than Para, and becomes more elastic and a little less than twice less resistant than Para.

The "caoutchouc des herbes" becomes more supple, less cohesive and more extensible than Para rubber. It improves in quality with the length of the vulcanizing process.

The time of vulcanizing has little influence on the suppleness, extensibility and even on the resistance of Para; and the short fatigue cycle of the latter is only about 1/6 of that of the before mentioned varieties.

The increase of the sulphur (mixtures of 6.9 per cent.) used in the vulcanizing process causes the two African varieties of rubber to resemble Para closely. It raises the general value even of Para; Funtumia comes worth 2/3 instead of 1/3 of the value of Para, while "caoutchouc des herbes" is worth 1/3.

The writer lays stress upon the arbitrary nature of the tests he has chosen for his determinations and upon the fact that the superiority of use of one rubber over another must not be deduced from his conclusions. The uses of Congo rubbers are different from those of Para; the former are preferred for the manufacture of certain articles on account of their softness. These experiments, on the other hand, show that it is necessary in the case of every kind of rubber to ascertain the optimum condition of vulcanization and, to this end, the conscientious investigator must make many experiments under varying conditions.

(1) The name "caoutchouc des herbes" is given to rubber extracted from the zones of *Carpodinus lanceolatus*, *Landolphia Henriquestiana* *Ciliandra*, etc. (Ed.)

(2) The writer uses the term "cyclic fatigue" for the percentage elongation at a weight shown by samples of rubber after 5 cycles, or successive applications of tension. (Ed.)

Rubber in the Philippines.

The Philippine Rubber Planting Industry.

ARTHUR, RICHARD. Rubber-Growing in the Philippines.

The India Rubber World, Vol. XLVII, No. 3, pp. 139-141. New York, December 1, 1912.

— Government Commissioner of the Moro Province of the Philippine Islands estimates that the total area under rubber in the Philippines is about 6000 acres, of which about 3000 are in the province of Mindoro and 500 in other provinces. On the other hand, official estimate of the Director of Agriculture places the area in rubber trees (approaching the bearing state) at about 1250 acres. The bulk of the planting has been done since 1909. At first Hevea, (*Manihot Glaziovii*) and Castilloa were tried, but hundreds of thousands of Ceara seedlings have failed to grow owing to drought or other reasons. Only Para rubber is now considered of value on the islands and it is estimated that 90 per cent. of the acreage at present planted is in that variety. In most cases Ceara and Castilloa have been abandoned, owing to their inability to withstand droughts and strong winds and their variability in yield of latex.

The following figures of the cost of production have been estimated by the Moro Province Government.

	Cost of bringing into cultivation an acre of new land				Costs of upkeep per acre			
	\$	£	s	d	\$	£	s	d
Moro Province	50.94	10	9	3	18	3	14	0
Subsidiary	73.60	15	2	5	20	4	2	2
Other	109.94	22	11	10	23	4	14	6
by States	—	—	—	—	29	5	19	2
Other Settlements . . .	137.42	28	2	10	—	—	—	—

It is claimed that in the Moro Province an acre of Para rubber can be brought into bearing (fifth year) for \$100, covering all charges, including cost of land;

Rubber is usually planted from 100 to 150 trees per acre. Five-year-old rubber trees have averaged three-quarters of a pound per tree; this brings the cost per pound of dry rubber, ready for shipment, at 3 cents (1s 4d) per pound, which can be reduced, as the yield increases with age. Native labor is procurable at 20 to 30 cents (10d to 3d) per day. Although Philippine rubber has up to the present scarcely entered the American market on a very limited scale, it has been well received in Europe, particularly in Hamburg and London, where in May 1910 it realized \$2.63 (10s 10d) per lb. and has ever since commanded the top price.

2. — Besides having published numerous technical articles on the rubber industry of the Philippines, the Bureau of Agriculture in the Philippines has arranged to distribute some 50,000 Para seedlings; these young plants will be carefully watched by the Bureau until well established. It is believed that no fungus diseases have been introduced into

the Philippines along with the seeds, which were obtained from Malaya. Nearly all districts of the Philippines, with the exception of Mindanao and some of the southern islands, are subjected to a dry season, but the Bureau of Agriculture believes that in many otherwise unfavorable localities the soil about the roots of the young seedlings can be kept sufficiently cool by the new system of leguminous «blanket crops», thus preventing injurious packing and baking by the sun.

259 - The Vitality of Hevea Seeds.

WILDERMAN, E. DE. Vitalité des Graines de l'Hevea. — *Le Caoutchouc et la Guttapera*. Year 9, No. 106, pp. 6776-6780. Paris, December 15, 1912.

After having given a summary of the experiments of Mr. F. G. Spring, Superintendent of the plantations of the Federated Malay States on the vitality and germinating property of Hevea seeds the writer makes the following observations.

According to Mr. Spring's experiments, of which the results are reproduced in the tables given later, it appears that 50 per cent. more of the seeds of untapped than of tapped Hevea trees germinate. It is an interesting fact that these experiments, while reversing the conclusion reached in 1908 in the *Circulars and Agricultural Journal of the Royal Botanic Gardens, Ceylon*, confirm the statement that the seeds of untapped trees are, on an average, 10.7 per cent. heavier than those of tapped trees of the same age.

To preserve the germinating property of Hevea seeds various methods of covering them have been used; Mr. Spring has made experiments as to their relative efficiency. The results show that the highest germination percentage is obtained by using either seeds from untapped Para rubber trees, or seeds from tapped trees, which have been envelopped in wax.

The writer of this article states that the necessity of knowing before hand the value of the plants to be raised, and the need for regular selection, are reasons for preferring the seed of tapped trees, while Mr. Spring's experiments show the value of covering the seeds with wax. This is however, costly; but if the seeds have to be subjected to a journey of over 45 days, the number of plants obtained from seeds thus treated will repay the expense incurred.

On the other hand, the experiments on the germinating property of seeds of tapped Hevea should be continued, to determine whether the germination percentage diminishes with the number of years tapping has been continued. Should this prove to be the case, which is probable, seed for sowing purposes should be selected from trees which have been seldom tapped, but yet often enough to afford some criterion of the economic value. Thus there remain to be made a number of experiments, whose results will be of great importance to the future of the plantations.

The following tables give the results of Mr. Spring's experiments:

I. *Germination percentage of seeds from tapped and untapped trees.*

Number of seeds per box	Duration of experiment	Number of plants from seed from trees		Percentage of germinated Seeds of trees	
		tapped	untapped	tapped	untapped
200	3 weeks	67	156	33	78
200	5 "	46	133	23	66
200	7 "	48	100	24	50
200	8 "	40	167	20	83
200	9 "	40	164	20	82
200	10 "	40	165	20	82

II. *Germination percentage of seeds of tapped "Hevea" trees, untreated and enveloped in wax and in paraffin.*

Number of seeds per box	Duration of experiment	Number of plants obtained		Germination percentage		
		Wax	paraffin	wax	paraffin	untreated
180	3 weeks	107	62	59	34	33
180	5 "	108	71	60	40	23
180	7 "	94	74	52	41	24
180	8 "	82	66	45	37	20
180	9 "	100	61	55	34	20
180	10 "	86	58	47	32	20

- Recent Studies on the Production of Natural Camphor.

BAILLAUD, E. Précisions nouvelles sur l'exploitation du camphrier. — *Journal d'Agriculture Tropicale*, Year 12, No. 138, pp. 362-367. Paris, December 31, 1912.

The writer had already mentioned in the *Journal d'Agriculture Tropicale* for June 30, 1912, the results obtained by growing the camphor in the United States and in South Africa; he now gives a short summary of the papers which have appeared more recently. The most important contribution is Mr. B. J. Eaton's study published as *Bulletin 15 of the Federated Malay States* in February 1912. This article

contains an apparently complete bibliography of the works published on camphor (1), and a short review of the results obtained from camphor growing in different part of the world.

The first experiments in the Malay States date from seven years ago, and, after five years, the trees were in as good condition as those of the same age in Japan.

According to Mr. Spring, the present Superintendent of the Experimental Plantations of the Malay States, the best method of propagating *Cinnamomum Camphora* is still by purchasing two-year-old plants from Japan, as experiments with seed and slips have proved unsatisfactory.

With regard to cutting, Mr. Eaton recommends beginning in the third year. An acre containing 700 three-year-old camphor trees produces annually in three cuttings 180 lbs. of camphor.

The distillation experiments have led to the following conclusions:

- a) A yield of about 1 per cent. of camphor and of oil consisting chiefly of camphor can be obtained from the leaves and branches of trees of five years of age and perhaps younger.

- b) The time of distillation ought not to exceed three hours in the case of the leaves of young branches.

- c) The proportion of camphor obtained from the leaves is greater than that yielded by the branches, and the yield of the small shoots more than that of the older branches of trees of the same age.

- d) Drying in the open air has no bad effect upon the yield, but this would probably not be the case if the leaves were exposed to the direct rays of the tropical sun.

The camphor tree seems to grow well in the Malay States in relatively poor laterite soils, provided they are well drained. These results agree with those obtained in the United States, the Union of South Africa (2), and British East Africa; consequently it seems clear that the true camphor tree can be grown in all countries with a tropical or sub-tropical climate.

In Formosa also, the "Bureau des industries productives" is going to start regular plantations in 1913-1914; these should provide for an annual production of about 3000 tons of camphor and a like amount of oil. An improved apparatus has been installed, allowing of 48 per cent by weight of camphor being obtained from the oil treated.

China appears about to take an important place in camphor production, since the Chinese traders now go into the interior as well as the valleys of the coast, and the export trade from the Northern ports is continually increasing.

* But besides the camphor tree of Japan, other trees are used as sources of natural camphor. In the first place should be mentioned *Blumea*

(1) An important contribution to the bibliography of camphor is made by Prof. Dr. GIGLIOLI, in his work entitled *La camfora italiana*. Roma, 1908. (E.A.)

(2) Warner in the *South African Agricultural Journal* of January 1912. (E.A.)

era, recorded in Tonkin in 1897 by Mr. Morice, and called by the natives "dai-bi". According to M. Lan, 400 lbs. of leaves produce of "bang-phien", which is the camphor-like substance obtained. In Burma, it is cultivated for local consumption, but the Forestry ce, while demonstrating that *Cinnamomum Camphora* can be grown at country with success, is also making preparations for the cultivation of *Blumea balsamifera*.

Some researches have been made on *Dryobalanops Camphora*; this supplies borneol, of which the neighbourhood of Sumatra furnishes 220 lbs. annually; it has been ascertained that the Borneo camphor is formed in the crevices formed in *Dryobalanops* by a beetle grub which has not yet been determined.

The linalool, obtained from a species of camphor tree called "shu-yohu", can also be extracted from real camphor oil.

Rosemary is also mentioned as a plant which may assist in the production of true camphor, as its oil gives 8 to 10 per cent. of a mixture of camphor and borneol; from the preponderance of the former it could be separated directly without recourse to chemical transformation. Laboratory experiments appear also to have been started in certain large French colonies.

- Experiments on Manuring Tobacco in Hungary.

KERPELY, KÁLMÁN. Dohánytrágyázási kísérletek. — *Dohány Njság*, Year XXX, No. 2, pp. 2-4. Budapest, January 20, 1913.

Experiments begun in 1897 by the writer, Director of the Royal Hungarian Experiment Station for Tobacco Cultivation at Debreczen, in 8 years of sandy soil to which from this date no manure was applied for 13 successive years, in order that the effect of the manures subsequently spread on the exhausted soil might be studied.

The yield of the tobacco grown during this time diminished in quantity and deteriorated more and more every year. While during the first few years the crop of "Szeged" varied from 1850 lbs. to 2000 lbs. per acre, in 1909 it was only 960 lbs. The analysis of the soil showed that, during these years, the loss of nitrogen and lime had been greater than that of potash and phosphates.

Finally in 1910, the application of chemical manures began. Owing to the special nature of the experiments, a larger quantity of manure than usual was used per acre, viz. 390 lbs. of 18 per cent. superphosphate, the same amount of 40 per cent. potash and 530 lbs. of nitrate of soda; the two were applied at the beginning of February and the last in two parts, at the first and the second hoeing. When, as in 1910, the rainfall is abundant, a satisfactory result can be confidently expected.

The following table gives the distribution of the various manures, the yields, and the combustibility of the tobacco before and after fermentation.

Plots	Manures	Amount of manure per acre	Yield per acre	Excess over control	Combustion of leaves per
					Before fermen- tation
		lbs.	lbs.	lbs.	seconds
1	Control (no manure for the 13 pre- ceding years)	—	998	—	23
2	Farmyard manure	46 350	1485	487	18
3	18 % superphosphate	390	1044	46	21
4	40 % potash salts	390	1176	178	29
5	Nitrate of soda	530	1632	634	16
6	18 % superphosphate	390	1300	302	32
	40 % potash salts	390			
	18 % superphosphate	390	1795	797	22
7	40 % potash salts	390			
	Nitrate of soda	530			
	18 % superphosphate	390	2110	1112	21
8	40 % potash salts	390			
	Nitrate of soda	530			
	Lime from sugar factories . . .	15 400			

The conclusions reached are :

The tobacco grown on the control plot showed a very feeble condition of development; its thin light-green leaves, 8 on a stem, manifested characteristic signs of want of nitrogen. It was deficiency in nitrogen that had reduced the yield; this was clearly seen from the plants which had been given nitrate of soda, whose much larger, thick dark green leaves, 12 on the stem, developed normally, while superphosphate and potash, whether used together or separately, had only a secondary effect on increasing the crop. In fact, the excess of plot 6 over the control was 302 lbs. while that of plot 7 was 797 lbs. The fertilizing effect of the lime with the superphosphate, potash and nitrate (plot 8) should also be noted; this was shown by a yield superior to that obtained from any other treatment. This effect is explained by the impoverishment of the experimental soil during the period of 13 years, when the lime content decreased from 0.112 per cent. to 0.112 per cent.

It was further shown that, thanks to the application of nitrate, a valuable and resistant substance was obtained, and though the control

the leaves was less than when other manures were employed, yet was obtained.

Experimental Station will continue its experiments; every three texture of farmyard manure and lime will be applied, other manures led every year, with the view of observing the effects due to the m of an excessive amount of manures during a prolonged period

3 Anatomy of "Jequirity" (Seed of *Abrus precatorius*) and its Seeds commonly used as Adulterants.

A. ROSA. Sull'anatomia del "Jequirity" (seme dell'*Abrus precatorius*) e del le piante comunemente usate per sofisticarlo. — *Atti della Reale Accademia dei Year CCCIX, Series V, Rendiconti, Vol. XXI, Part 12, pp. 859-863. Rome, per 15, 1912.*

is an anatomical and microchemical study of the seeds and powders of *Abrus precatorius* L. and of those of other Legu- with which they may be confused or fraudulently mixed, the seeds of *Rhynchosia precatoria* or *phaseoloides* D. C.; of *era pavonina* L.; and of *Ormosia dasycarpa* Jacks.

3 Naples Tomato.

REWICK, ED. La Tomate de Naples. — *Revue de Viticulture, Year 20, Vol. XXXIX, 17, pp. 117-119. Paris, January 23, 1913*

variety known as the "Naples Tomato" is much cultivated in bourhood of the city of Naples. The fruit is exported in large s to the German markets, where it is much prized for its size, shape, smooth skin, colour, fragrance, and firmness. The plants g, productive and disease-resistant.

writer made experiments in two market gardens in the neigh- of Avignon (Vaucluse) where the soil is formed of the recent of the Durance, and is a marl rich in nitrogen and phosphoric containing a fair amount of potash. The "second early" f cultivation was adopted, as is usual in the district; that is to plants are forced half the time in frames and then planted out. unt of manure used per acre wes as follows: farmyard manure, ; sulphate of ammonia, 180 lbs; sulphate of potash, 180 lbs.; cent. superphosphate, 360 lbs. Two applications of soap mixture of Bordeaux mixture were made.

was shown that the Naples variety possesses all the above-men- qualities; and it is so suitable for export that it fetches 10d per re than the other tomatoes on the market.

ther, Naples tomatoes are more productive than the local vari- 8, 20 and 22 lbs. per plant in each of the two market gardens, st 13 to 15 ½ lbs. for the Rochefort variety).

: writer therefore recommends the cultivation of the Naples which will find a ready sale in a district where the exports of cease every year.

264 - The Kerguelen Cabbage.

POISSON, H. Le Chou de Kerguelen. — *Revue Horticole*, Year 85, No. 1, Paris, January 1, 1913.

The Kerguelen cabbage (*Pringlea antiscorbutica*, R. Br.) is of Kerguelen and the adjacent islets. It has a stalk 28 inches long; its root is 6 inches in length. At the top of the stalk is a small cabbage-head; this is composed of green leaves with well defined central veins and secondary veins similar to those of European cabbages. The outer leaves droop; the succeeding ones, which are yellow inside white, form a compact "ox-heart" 10 in. high and 12 in. wide. Around the head and on the stalk grow the floral spikes, which are 16 in. high, the flower-bearing portion reaching a height of 16 in. and bearing 100 to 150 flowers. The fruit is a silique about 2 in. long by 1/4 in. broad. The seed, which is white and irregularly triangular, is 1/4 in. long and from 2 to 3 wide at the base.

Pringlea antiscorbutica is a valuable plant in cold countries, used, like many other Cruciferae, as a preventive of scurvy. It is an article of food; the heart can be eaten raw or made into soup and the pith of the stem is edible, its taste much resembling horse-radish.

Finally, the seed is eaten raw and tastes like hemp-seed or flaxseed; as each inflorescence bears 100 to 150 flowers and there are 50 seeds to a fruit, this makes from 5000 to 7500 seeds on an inflorescence.

This plant requires, when cultivated, a rather light and fertile soil, such as results from the decomposition of basalts; it may contain some salt. It seems worth while acclimatizing this cabbage in the cold countries of the north, where it would be a great resource for the inhabitants and their domestic animals. But even if it is grown in temperate zones, *Pringlea antiscorbutica* would then serve as an object of curiosity.

265 - A Substitute for Flower-pots: Tubes of Giant Reed (*Arundo Donax*).

PÉREZ, GEORGES V. Pour remplacer les pots : Tubes de roseau de Provence (*Arundo Donax*). — *Journal de la Société Nationale d'Horticulture de France*, Year IV, Vol. XII, 718. Paris, November 1912.

For a long time past, in Australia and at the Cape of Good Hope, tubes formed by pieces of stalk of the giant reed (*Arundo Donax*) have been used for large plantations of various kinds of acacias as well as for the propagation of Eucalyptus. These tubes occupy less space and are more fragile than the usual flower-pots; they allow hundreds of plants to be raised for months while waiting for the favourable moment for planting. They offer also great advantages for transport over long distances and for reforesting dry soils.

The writer has employed this system to advantage for the last few years; he has thus been able to obtain in two months rooted cuttings of *Atriplex nummularia* by introducing into the tubes herbaceous

seeds. In order to use these cuttings the only thing to be done is to make a hole in the ground and place a tube containing a plant into it. The writer has no doubt that in desert, sandy and even salt soils, the same may be achieved with this system in the production of valuable

Notes for Vines.

REV. Fertilisants pour la vigne. — Revue de Viticulture, Year 20, Vol. XXXIX, pp. 33-36. Paris, January 9, 1913.

Experiments with different manures were made in 1912 in the vineyards of Fontliasmes and they will be repeated for three consecutive years. The manures were spread before the first spring ploughing. The results of the Fontliasmes vineyards are remarkable for their definiteness. Many analyses of the different plots of ground have been made and the figures obtained have in every case been very similar to the figures given below. The only factor which varies appreciably is the texture of the soil, depending on its clay content. Fine soil, 76.40 per cent. calcareous stones, none; siliceous stones, 23.60 per cent. In the parts of fine soil there are: sand, 92-80; clay, 5-17; lime, traces; nitrogen, 0.14; phosphoric acid, 0.05; potash, 0.096; lime, 0.052; silica, 0.30; water and substances soluble in acidulated water,

Weight per acre, calculated on 0.14 (one-seventh) acre.

Experiment with sulphate of potash at 2.4 cwt. per acre.

as to their situation; nature of the soil	Number of bunches	Weight of bunches		Yield of must		
		average	total	%	Total	
		lbs.	lbs.		gallons	
a little dry hail, dry com-	without potash	28 700	0.238	6 840	63	427
	with potash	36 300	0.251	9 132	66	601
touch- Loam, warm,	without potash	33 200	0.222	7 478	60	441
	with potash	26 700	0.255	6 830	68	463
ly hurt ; west m, very cold.	without potash	30 750	0.198	6 191	55	338
	with potash	31 600	0.209	6 610	57	374
t. Loam, cold.	without potash	32 000	0.220	7 048	60	422
	with potash	32 000	0.242	7 761	64	494

Experiments with manures containing manganese.

Plots and their situation; nature of the soil; manures used	Number of bunches	Weight of bunches		Yield %
		Average	Total	
		lbs.	lbs.	
<i>Manganese at 1.6 cwt. per acre.</i>				
I: west part; a little injured by hail. Loam, fairly compact, cold.	Without manganese	25 700	0.211	5440
	With manganese	31 850	0.220	7020
I: east part; untouched by hail. Loam, stony, dry, warm;	Without manganese.	33 200	0.273	9070
	With manganese	30 750	0.284	8830
<i>Lime and manganese at 1.6 cwt.* per acre.</i>				
II: all slightly injured by hail; west part. Loam, very compact, cold.	Without lime and manganese	27 500	0.202	5575
	With lime and manganese. .	29 950	0.220	6600
II: east part. Loam, compact, cold.	Without lime and manganese	30 350	0.216	6560
	With lime and manganese. .	31 600	0.231	7315
<i>Sulphate of manganese at 0.4 cwt. per acre.</i>				
I: west part; a little injured by hail. Loam, fairly compact, cold.	Without sulphate of manganese	27 700	0.233	6470
	With sulphate of manganese.	28 700	0.246	7090
I: east part; untouched by hail. Loam, stony, dry, warm.	Without sulphate of manganese	28 100	0.288	8110
	With sulphate of manganese.	30 550	0.290	8885

Each experimental plot consisted of 50 ares (1.23 acre) selected in the middle of a hectare (2.47 acres) in such a manner as to leave a portion at either end, which was unmanured. The vine used was, with exception the Folle Blanche des Charentes.

The results of numerous previous experiments had shown that the yield in must increased with the weight of the grapes. In a good year when the fruit ripens normally, the average weight of the bunch in Fontlasmies vineyards for Folle Blanche is 125 gr. and the yield is from 73 to 75 per cent. The above tables have been drawn up

its obtained every year from 1901 to 1908. The figures must be absolutely, for they depend to some extent upon the degree of the fruit. When the average weight of a bunch of Folle d'Espagne is 135 gr., the average must yield (weight) will be 77 per cent.; 125 gr., 73 per cent.; 120 gr., 70 per cent.; 110 gr., 64 per cent.; 100 gr., 60 per cent.; 95 gr., 57 per cent.; 90 gr., 55 per cent.

1 plot 6 ares (0.14 acre) at each end, i. e. 12 ares in all, were the comparative verification with adjoining areas of the same size and soil; the bunches gathered from all this area were counted and the average bunch-weight and the must yield were ascer-

gared; the content of the juice from each plot was tested by means of a hydrometer, but the data are inaccurate owing to the very bad weather which prevailed during the vintage of the plots used for verification of the

certain observations due to cultural accidents, the above data are furnished by the verifications.

Influence of electricity. — Experiments in obtaining electricity from the atmosphere have been attempted, using metal rods, to test the effect of the current. Iron rods $\frac{1}{4}$ in. in diameter and provided with a spiral of copper attached by screws were employed. The rods, fixed in height, were spaced at double the distance of their height from the ground, and kept in a vertical position by supports of wood, inserted in the soil to a depth of about 6 in. and a length of 1 m. was placed horizontally below the ground. The results for the short rods (6 ft. 6 in.) and the long rods (11 ft. 6 in.) were exactly of the same nature.

The results are given in the following table:

and their situation; nature of the soil	Number of bunches	Weight of bunches		Yield of must		
		average	Total	%	Total	
		lbs.	lbs.		gallons	
it; a d by fairly old.	Without rods	9 950	0.284	2 830	74	205
	With rods	13 300	0.246	3 277	65	214
; un- half, dry,	Without rods	15 600	0.220	3 435	60	205
	With rods	14 300	0.240	3 479	63	214

The following figures are the averages of those given above (off):

<i>Experiments with sulphate of potash.</i>						
With	31 650	0.240	7 580	64	46	
Without	31 150	0.220	6 870	60	46	
<i>Experiments with carbonate of manganese.</i>						
With	31 100	0.240	7 440	64	513	
Without	29 200	0.224	6 660	61	414	
<i>Experiments with sulphate of manganese.</i>						
With	29 650	0.268	7 990	70	570	
Without	27 900	0.260	7 290	68	499	
<i>Experiments with atmospheric electricity.</i>						
With conducting rods	13 800	0.264	3 350	64	214	
Without conducting rods . . .	12 750	0.253	3 130	67	205	

The potash manures gave an increase in the net return of about 10 per cent. and the manures containing manganese an increase of about 15 per cent.; the chief action in the latter case is attributable to the lime and manganese, which seems quite natural, given the small amount of lime present in the soils experimented upon. The differences in the total weight of the yields are as a rule unimportant, but what is constant (except in the case of a plot furnished with metal rods) and remarkable, is the increase in the average weight of the bunch under the influence of the different manures used, and also as a result the increase in the must yields.

267 - The Cultivation of Mulberry Trees in Madagascar.

FAUCHÈRE. La culture du Mûrier au Madagascar. — *Bulletin Economique de Madagascar*, Year XII, No. 2, pp. 19-38. Tananarive, 2nd Half-year, 1912.

It is well known now that all the forms of mulberries that are met with in the Madagascar plantations belong to the species *Morus alba*. It is probable that it is the same white mulberry that forms all the mulberry groves of Asia. But the mulberry is a tree extremely subject to variation, and in the Madagascar plantations alone there are at least 20 or 30 different forms of a mulberry called Malagasy or native mulberry. They are far from being all the same value, and it is indispensable to multiply only the most vigorous and productive kinds, all the more so as those which produce the most abundant and most developed leaves are also those least susceptible to the disease known as "leaf mildew". Besides the native mulberry which Prof. Cornu considered as a variety *indica* of *M. alba*, other varieties have been introduced since the French occupation, among others the Japanese mulberry or *multicaulis*, which has succeeded perfectly in the Madagascar plantations, and which has the advantage of being very early in producing leaves very soon.

A subvariety of this mulberry, the Lou mulberry, seems to suit especially the high parts of Vakinankaratra where frosts are to be feared during the first fortnight of September, as it is a very late form.

beginning to appear till the end of that month. Another variety would be advantageous to import is the Tonking mulberry, which, shrub, would give leaves almost throughout the year.

Site. — The mulberry finds in the whole island a suitable climate, it is true that in the parts situated above 4500 feet the September use serious damage to the trees, yet they never endanger their the west coast mulberries thrive very well, as well as at Diego de la Mata and Fort Dauphin. The east winds retard the vegetation if early leaves are required the trees must be protected against

— The deep and moist alluvial soils along the river courses in the east, as well as the volcanic soils, suit the mulberry admirably; compact and swampy soils in which moisture stagnates are unfavourable, nevertheless in very moist soils mulberries grow very well after effluvia.

Multiplication. — The multiplication by cuttings is extremely easy in moist climate like that of certain districts of Madagascar. In the countries therefore cuttings of either herbaceous or lignified may be used.

cuttings of lignified branches, one-year-old branches about a foot are adopted. The soundest and best developed ones are selected either planted at once where the tree is to grow or put into a pot. The latter method is preferable for the centre of Madagascar, where periods of drought prevail. For this reason the best moment for the nursery is between July 15 and August 15, a time that corresponds in Europe.

The best time for multiplication by herbaceous cuttings is the rainy season between the end of December and the first fortnight of February; woody extremities of healthy branches are taken from the most vigorous mulberries and they are planted directly where the tree is to stand; it is also to mulch the soil with grasses after planting the cuttings. On the east coast and in the forest regions all the precautions which are taken in the centre and on the western slope are almost unnecessary, multiplication by cuttings can be done easily at any time of the year. It is not advisable to waste time in multiplying mulberries by means of grafting, it does not present any difficulty. Cleft grafting should be done at the moment when vegetation reawakens, that is, for the centre of Madagascar, at the end of July and the beginning of August. Crown grafting is performed during the course of vegetation, from October to the end of the year in the centre of Madagascar, and no doubt in the whole southern region.

The best time for shield-grafting mulberries is from September 15 to October 15; but it is not impossible that on the east coast shield and crown grafting may be carried out during the whole year, as the mulberries are vigorous throughout the year.

Choice of the site of a mulberry plantation. — The natural conditions of the soil do not always allow of an easy choice of the soils having all

the desired requisites, and one must often put up with medium at best, if plenty of manure is available, the mulberries may be planted elsewhere. At the Namisana Station mulberry groves have been planted on very dry soils consisting of extremely poor laterite and the trees have grown very well; it is true that the plantations have been very carefully prepared and their soils vastly improved with the refuse from Antananarivo.

Preparation of the soil and planting. — Breaking up the soil for digging the holes for planting must be done during the rainy season or during the two following months, because when the soil is dry these operations cost twice as much. In rice-fields or in alluvial soil, breaking up the soil does not appear to be necessary, as these soils are generally sufficiently loose. In the centre of Madagascar planting out must be done during the rainy season; it presents no difficulty. If a plantation is made during the dry season, resort must be had to irrigation or at least to abundant watering after planting.

Distance between the trees and shapes to be given to the trees. — The distance to be kept between the trees varies considerably, according to the method of cultivation adopted and to the fertility of the soil.

Mulberries may be grown as hedges, dwarfs, half-standards and standards. As hedges they produce leaf very soon, especially in warm moist climates; the drawback is that the hedges require a great number of plants or of cuttings. The writer advises the silk growers of Madagascar to grow dwarfs and half-standards not above 3 or 4 ft. high. In plantations such trees must be placed at about 10 ft. from each other.

The trees are preferably shaped in the nursery; half-standards need about three years, while dwarfs form their stems in one year.

Upkeep. — The successive cultivation of mulberries consists of hoeing once or twice a year, manuring, pruning and the control of insects.

In the centre of Madagascar it is generally sufficient to hoe twice a year; green manures such as pigeon pea and Réunion mimosa are recommended, as they introduce into the soil a certain amount of manure besides plant food. Pruning presents no difficulties in tropical countries; it is indispensable every year for the hedges, and consists in cutting the branches of the year to 4 or 6 inches from the soil.

Duration and yield of mulberry plantations. — It is not yet known to what age mulberry trees produce satisfactory leaf crops, but judging from the specimens which grow freely near certain villages in the centre of Madagascar it is reasonable to suppose that they will continue to produce leaves for several decades. Grown as hedges it is generally necessary to replace them after five or six years.

The leaves may be gathered, according to the writer, twice a year from the same tree under the climate of Antananarivo; three crops may be obtained where the soil is very fertile, and on the east coast it would be possible to have four or even five crops without endangering the existence of the trees.

As for the returns, no exact figures are available; nevertheless, the results obtained at Namisana warrant the belief that a plantation of

own as hedges under the best conditions yields in two crops 64 to 80 leaves per acre.

ests. — The insect which causes most damage to mulberries in Madagascar is a kind of scale, doubtless related to *Diaspis pentagona*, and common in the same way as this. Other pests of mulberries are: *Callimacrus*, a longicorn about $\frac{1}{3}$ of an inch long; the "fanetrike", a bug; and the "fovato", a weevil known as *Alcides excavatus*. A very injurious fungus is a leaf-mildew, named by M. Delacroix *Ovularia moricola*, which is controlled by selecting the large-leaved varieties and by keeping the soil of the plantations in a good state of fertility.

Production of a New Variety of Cherry by Shield-Budding.

ELINCK, F. in *La Tribune Horticole* quoted by ROIS, D. and GRIGNAN, G. T.: influence du sujet sur le greffon. — *Revue Horticole*, Year 85, No. 2, pp. 27-28. Paris, January 16, 1913.

About ten years ago, at Swynaerde, near Ghent, an Early Rivers cherry was shield-budded on a Mahaleb stock near the base. The operation was performed in August, and proved quite successful, the stock cut back the following spring. After four years the first crop of cherries was obtained, and the cherries borne by the new tree were of a pinkish-white colour instead of dark red like those of the parent tree, ripened a week later in ripening. A shoot of this new variety was then grafted on to a wild cherry (*Prunus avium*) in order to see whether it would revert to its original condition; however, the new variety retained the characters of the new variety, i. e. of colour and of early maturity.

Citrus Growing in Rhodesia.

Rhodesia Agricultural Journal, Vol. X, No. 2, pp. 216-220. Salisbury, Rhodesia, December 1912.

The Mazoe Citrus Syndicate was formed in 1909 and is now farming 1000 acres near the junction of the Tatagura and Mazoe Rivers. Their first organised effort to grow citrus fruits on approved lines in Rhodesia and there is every reason to believe that the country is eminently suited to the culture; the fact that the fruit ripens there during the dry season, and can therefore be put on the home market at a season when there is no competition from other sources, is a great advantage.

A grove of 1000 trees of the Washington Navel Orange, budded about 1890 from the ground on the native wild lemon stock, was planted in February 1910, the buds being then two years old. A second thousand were planted in December 1911, the buds being then one year old. The average measurements of these trees at present are:

	Height	Circumference of spread of top	Circumference of stock at union
	ft. in.	ft. in.	in.
Planted in 1910	6 1	2 7	6 $\frac{1}{4}$
" " 1911	4 0	6 6	4 $\frac{1}{2}$

Another grove, of 2 000 Navel trees, 28 Satsumas, 58 Valentias, and 10 lemons, was planted three years ago on high rocky ground and is doing very well. There is a large nursery stock, all on the native lemon and a further 3 000 trees are to be planted out during the present wet season.

The slight frosts encountered have not injured the trees, but are likely to be beneficial to the fruit by sweetening it and improving quality. So far no fertilizers or manure have been employed, neither irrigation been practised; but as it is desirable to make provision for application of water in exceptionally dry seasons, or even in ordinary seasons if yield and quality are thereby improved, the Syndicate is engaged on an irrigation scheme which will probably be operating in a dry season.

270 - Cacao Manuring Experiments in Dominica.

TEMPANY, H. A. in *Report on the Agricultural Department, Dominica 1911-12*, pp. 20, Barbados, 1912.

In 1900, an acre and a half of a 10-year-old cacao plantation was set out at the Botanic Station and divided into five plots, each of which received a different manurial treatment applied annually from 1901 to 1912. The following are the average returns for the period:

Number of Plot	Manurial Treatment: cwt. per acre	Wet cacao: lbs. per acre	Dry cacao: * lbs. per acre	Cost of manuring: per acre	Net gain: per acre
1	No manure	2800	1176	—	—
2	Basic phosphate 4. Sulphate of potash 1½.	3369	1415	2 5 3	3 14
3	Dried blood 4.	3261	1370	1 16 0	3 1
4	Basic phosphate 4. Sulphate of potash 1½. Dried blood 4.	3876	1628	4 1 3	7 4
5	Mulched with grass and leaves. .	4233	1778	3 0 0	12 1

* Calculated from the wet yield assuming 42 lbs. of cured cacao = 100 lbs. wet cacao.

** Taking the value of cured cacao at 6d. per lb.

The artificial manures are distributed over the surface of the ground and lightly raked in. The mulch consists chiefly of grass from lawns, leaves and pods of the saman tree (*Pithecolobium Saman*), and is applied at the rate of 4 baskets of 20 lbs. each to every tree. No forking has been performed since the beginning of the experiments.

the returns of the mulched plot have been uniformly highest, Plot next in order, and in both these cases, the level of the yields was steadily increased during the first 5 or 6 years and then remained more stationary, fluctuating with the seasons. In the case of Plots 2 and 3, which receive incomplete dressings, and of Plot 1, with no manure, there has been no accumulation of fertility; but neither have the yields declined, which may be expected to occur in future. The superiority of the treatment on Plot 5 is substantiated by the excellent appearance of the

From other experiments carried on at the Botanic Station during the years 1907-12 indicate: 1) that mulching is equally efficacious on a steeply sloping hillside and on the flat, and 2) that a mulch of grass and leaves is equal to an application of 600 lbs. per acre of cottonseed meal.

New Experiments on the Cultivation of Walnut Trees.

REDMANN. Neuere Erfahrungen über die Anzucht einiger Juglande. — *Allgemeine Forst- und Jagd-Zeitung*, Year 88, pp. 257-272 + 1 fig. Frankfurt a. M., August 1912.

1. ID. Nachtrag zum Artikel "über Juglanäen" im August-Heft 1912. — *Ibid.*, pp. 403-404. December, 1912.

BRANDSTETTER, J. v. Zur Kultur von *Juglans nigra*. — *Oesterreichische Forst- und Jagd-Zeitung*, Year 31, No. 2, pp. 10-11. Vienna, January 10, 1913.

BREYER, Sir H. R. Oak and Black Walnut Plantation. — *Quarterly Journal of Forestry*, Vol. VII, No. 1, pp. 28-29. London, January 1913.

SOMERVILLE, W. Raising Black Walnuts. — *Ibid.*, pp. 32-33 + 1 fig.

There is no doubt that the walnuts *Juglans regia*, *J. nigra* and *J. cinerea* are among the most valuable kinds of trees. But, notwithstanding the limits of the area on which they live, their numbers are diminishing in Europe and North America, in consequence of the great demand for them not being made up for by their reproduction. Lately measures have been taken and experiments commenced in various countries in order to promote the cultivation of these precious trees, especially *J. regia* and *J. cinerea*; in Austria-Hungary about 1890, in Prussia in 1903, and in Hesse, Bavaria; also in Switzerland and, as it appears, in England.

As a basis to be adopted for the cultivation of the above walnuts the limits for *J. regia* may be considered to be between 44° and 52° N. and for *J. cinerea* still further north, as they are killed by frost only at 10° C. (- 34° F).

As for the soil suitable for walnuts, there is no agreement among the writers and practical men. According to some, especially for *J. regia*, a calcareous soil is considered necessary, whilst others do not share this opinion. The writer has made an enquiry which yielded the following interesting results. For a tree about 60 years old standing by itself the following diameter breast-high may be reckoned upon:

	Inches
Sandy soil	15½ to 17
Schist soil	19½ to 21½
Good sandy alluvial soil	21½ to 23½
Rock soil <i>in situ</i>	23½ to 25½
Calcareous soil, loam and loess	25½ to 27½

Anyhow, the finest development is met with on deep calcareous loess soils; so that it is believed that it is not so much the chemical composition of the soil as its physical properties such as depth, moisture, and aspect that have a special influence.

The most favourable localities are on hills, on the slopes of mountains and in spacious valleys. And what is said of *J. regia* holds good for the other two species, *J. nigra* and *J. cinerea*, with the difference that the two latter are much more exacting as to depth, looseness and moisture, and perhaps also as to the content in mineral substances.

The writer is of opinion that direct sowing is absolutely to be preferred to planting, provided that germination has taken place by the end of May. With this object he proposes the following method of sowing: the completely ripe fruit must be freed from its husk and dried so as to prevent formation of moulds, after which the nuts of *J. nigra* and *J. cinerea* are placed in the ground in November at a depth of $2\frac{1}{4}$ to $2\frac{3}{4}$ inches, and the rate of 6 or 7 thousand nuts on a few square yards. If cold is to be expected the soil should be covered with litter. The fruit of *J. regia* on the contrary preserved in a dry place in sand or ashes and put into the ground in May. In order to facilitate germination, as the season opens, the ground may be covered with stable manure. As soon as the nuts have germinated and shoots are 2 to $2\frac{1}{2}$ inches long they are collected and planted in places. As for plantation, the best method would be planting them alone in clumps, at intervals of 5 feet or in belts with spaces of 4 ft. 7 in. \times 4 ft. 3 in., or 4 ft. \times 3 ft. 7 in. or 3 ft. 3 in. In plantations under covert development is less rapid but more regular. On the mode of development the writer gives the following instructive tables.

I. Height of plants in feet and inches:

Species	a) in the open				
	1st.	5th.	7th.	10th.	15th y.
<i>J. nigra</i>	1 ft. 4 in.	8 ft. 8 in.	13 ft. 1 in.	19 ft. 4 in.	28 ft. 1 in.
<i>J. regia</i>	10 in.	6 ft. 0 in.	9 ft. 3 in.	14 ft. 11 in.	23 ft. 1 in.
<i>J. cinerea</i>	7 in.	4 ft. 1 in.	8 ft. 4 in.	—	—

b) under covert				
<i>J. nigra</i>	8 $\frac{1}{2}$ in.	3 ft. 11 in.	5 ft. 8 in.	
<i>J. regia</i>	8 in.	4 ft. 5 in.	7 ft. 0 in.	
<i>J. cinerea</i>	3 in.	1 ft. 10 in.	4 ft. 1 in.	

II. Development at 76 to 79 years.

Isolated, full crowned.	Diameter	25 to 36 inches; average 28.7 inches. 263.4 cub. feet of wood.
At a distance of $\frac{1}{6}$ crown from each other.	Diameter	22 to 31 inches; average 24.7 inches. 177.6 cub. feet of wood.
Dense, $\frac{1}{2}$ crown.	Diameter	17 to 23 inches; average 20 inches. 99.3 cub. feet of wood.
Crowded, $\frac{1}{6}$ crown.	Diameter	11 in. to 18.9 in.; average 14.9 in. 43.78 cub. ft. of wood.

Among subsequent operations hoeing is recommended, especially isolated trees, and pruning both the lateral and frost-killed twigs, as the main ones when it is desired to limit the development in height. In the management of walnuts it must be borne in mind that they are very like oak trees respecting light and that consequently they require similar treatment and especially a thinning out at the age of twenty

Besides the production of walnuts by *J. regia*, which may be set down at an average of 2000 per tree in the full years, there is the production of *J. nigra* may be estimated to yield at 80 years a final product corresponding to the normal product of oak trees of twice that age, namely 7945 cub. ft. per acre on first class soils; the production of *J. cinerea* is somewhat less.

The writer gives the following values per cubic foot in south Germany:

		s	d
for logs measuring	47 to 57 inches in circumference	1	9½
" "	59 to 69 " "	2	4¼
" "	70 to 82 " "	2	11
" "	82 in. and above	3	4

The writer admits the possibility of natural regeneration of *J. regia*, but it seems doubtful in the case of *J. nigra* and *J. cinerea*.

The following is a comparison between the cost of cultivation per acre of these walnuts and of oak.

Expenses on 126 acres under walnuts.

	£	s	d
1. Work of planting	277	8	9
2. 8272 lbs. of nuts	90	12	0
3. Production of 56 500 one-year old seedlings	10	15	7
4. Interculture, I and II year	95	1	2
5. Surveillance	26	14	0
Total	£500	11	6
per acre	£3	19s.	5½d.

These calculations hold good for the period 1891-1910 and for Alsace. General and under present conditions the outlay per acre and for 2630 lbs of *J. nigra* and *J. cinerea* may be set down approximately as follows:

	£	s	d
1. Preparation of the soil in strips 4 ft. 8 in. wide	4	3	4
2. 2910 nuts	15	1	
3. Sowing 3 ft. 8 in. apart	17	10	
4. Weeding	1	3	7
Total	£36	19	10

The above outlay is reduced by about 6 shillings for *J. regia* to the lesser cost of the seed nuts.

The expenses for an acre under oak and for 2430 plants are about following :

a) *Sowing.*

	£	s	d
1. Preparation of the soil in strips 4 ft. 8 in. wide	4	3	4
2. 16½ bushels of acorns	19	10	
3. Sowing	17	10	
4. Weeding	11	10	
5. Surveillance	3	4	8

Total £ 9 17 6

b) *Planting.*

	£	s	d
1. Preparation of the soil and planting out	5	7	1
2. 2430 oak saplings 5 to 6 years old	1	8	8
3. Cultivation and surveillance	1	3	10

Total £ 7 19 7

The writer notes lastly that in order to judge surely the full in and financial bearing of a method of culture for a given kind of forest about 30 years of experience are required.

3. — The above data agree in their general lines with the following practical rules, the result of many years' practice in a forest estate of ours :

I. The soil should be a deep, somewhat clayey loam or moist soil containing humus.

II. The walnuts should be sown if possible with their husks as deep as 3¼ inches.

III. For planting, seedlings one or two years old at most to be and their tap root cut cleanly at 12 inches.

IV. Mixing with other kinds of trees suitable to favour development height and clean stems.

V. Hoeing and weeding.

VI. Pruning for the proper formation of the crown and when the is 16 to 20 ft. high.

VII. Protecting the plants from excessive shading, which hinders normal development.

VIII. In game preserves, protection against damage caused by animals.

IX. Thinning out in due time to favour a normal formation of the crown and the increment of wood and the independence of the trees.

4 and 5 — From the two English experiments quoted the following considerations are drawn :

1. The greater productivity of *J. nigra* in comparison with oak walnuts have the same volume as 20 oak trees in the same stand 80 years old).

It appears that the American seed of *J. nigra* is much superior to English seed, both for its power of germination and for the vigour of seedlings.

Twenty-five Years of Reafforestation in the Karst in Carniola.

RUDBIA, K. Fünfundzwanzig Jahre Karstaufforstung in Krain. — *Bericht der Aufforstungskommission für das Karstgebiet des Herzogtums Krain über die Tätigkeit vom Jahre 1886 bis Ende 1911*, pp. 97 + figs 2. Lubiana, 1912.

In Carniola the reafforestation of the Karst (1) was undertaken in virtue of special law and through the agency of a commission appointed on October 1, 1886.

Under the agricultural and forestry conditions of the two Karst districts according to the general land registry of 1870 as follows:

	Adelsberg acres	Loitsch acres
High forest	39 375	149 723
Coppice	5 053	6 491
Common pastures and alps	67 006	57 395
Unproductive land	4 566	5 864
Agricultural land	83 911	79 458
Common pastures	sandy Karst soil 21 704	—

The South European Karst region extends, for the major part in Austrian territory, from the Alps to the borders of Greece and covers about 193 000 square miles. The Karst comprises a limestone plateau on the Austrian and Carniola coast. The reafforestation of the Karst originated in a resolution passed by the "Oesterreichischen Reichsförstvereins" at Vienna in 1865. After several attempts, this resolution was adopted in the laws for the reafforestation of the Karst, for the territory of the city of Trieste on September 27, 1881, for the county of Görz and Gradiska on December 9, 1883, for the Duchy of Carniola on December 9, 1885, and for the March of Istria on May 7, 1886. The characteristic of these laws consisted in the constitution of a Commission for the reafforestation of the Karst, with the duty to form a reafforestation registry, comprising all those lands which, in the interest of the country, it was deemed necessary to reafforest within a given time. The State was also empowered to expropriate such lands. In 1906 the reafforestation land registry bore the following figures:

	Karst Lands sq. miles	Lands entered in the reafforestation registry sq. miles
Trieste	23.13	4.51
Görz and Gradiska	748.26	31.98
Istria	1 411.32	53.10
Carniola (Adelsberg)	2 878.14	14.27
Total	5 060.85	103.86

1. RUDBIA, K. Oedlandaufforstungen: Mittel zu Ihrer Förderung (Die Aufforstung des Oedlandes in Oesterreich). — *VIII Internationaler Landwirtschaftlicher Kongress*, Sektion Forstwesen, Bd. II, pp. 22. Wien 1907; LOREY'S *Handbuch der Forstwissenschaft*, 11. Aufl., I. Bd., pp. 67-68. Tübingen, 1903; FERNOW, B. E. *A Brief History of Forestry, in the United States and other Countries*, Austria Hungary, pp. 158-159. Toronto, Ont. (Ed.).

Taking into account the unproductive lands and the pastures, 19 acres are to be considered as Karst lands.

According to the reafforestation register there were at the end of

	acres
Areas to be reafforested, Adelsberg	9 369.5
" " Loitsch	239.0
Total	9 608.5
Of these, reafforestation has been carried out on	7 191
There remain to be reafforested	2 417.5

The 9608.5 acres entered in the reafforestation registry are divided as follows :

	acres
Collective property	6 862.0
Communal "	21.5
Private "	2 716.5
Expropriated "	8.5
	9 608.5

The data concerning the cost of reafforesting and of interculture of practical interest:

Cost	Planting per 1000 plants			Planting per acre		
	Extremes	Average		Extremes	Average	
Labour only	4s 9d to 8s 7½d	6s 6d	17s 3d to 21 15s 3d	21 15s 3d	21 15s 3d	1 11s 1
Total cost	6s 0d to 9s 11d	7s 10 ½d	21 1s 11d to 22 0s 11d	22 0s 11d	22 0s 11d	1 11s 1

Filling up gaps per 1000 plants			Filling up gaps per acre		
Labour only	4s 4½d to 9s 0 ¼d	6s 1 ½d	—	—	—
Total cost	5s 8 ¾d to 10s 3 ¾d	7s 8 ½d	—	—	11s 7

The above data refer to 6566 acres replanted with 26 043 270 mm plants ; and which required 18 491 440 plants (71 per cent) for gapping and with intercalary plantations and under covert, 1176 017 plants 7116 lbs. of fine forest seeds on 1184 acres.

According to article 5 of the Law on reafforestation, the plants to number of 44 180 577 (96.6 per cent.) were taken from the State nurseries at the nominal price of 10 d per 1000 plants, besides some free of charge 545 050 were supplied by the Commission's nurseries and 984 700 from private nurseries ; altogether 45 710 727 at an average cost of 11 ½d thousand.

As for protection, it is to be noted that of the 238 acres which were destroyed by fire, 144 acres were burned through imprudence, 41 by spe

omotives, 53 by unknown agencies. 19 612 feet of new firelines were and 168 811 were re-established; 122 360 ft. of new protection walls built and 19 453 ft. were repaired, and 6 819 feet of wire netting were

of a total of £27 101 set apart for all these works from 1887 to 1911, cent. is contributed by the State, 13.2 per cent. by the Province, other parties concerned and 7.2 from various sources. The expending the same period amounted to £27 005 8s, and of this sum 68 was spent in reforestation proper, or 72.8 if the cost of nurseries protection is included; 0.4 per cent. was devoted to the purchase of 14.8 to surveillance, 0.4 to the reforesting registry, 3.4 to the sion, 2.2 to the secretary's office, 2.4 to rewards, and 3.6 to sundries. om the sylvicultural point of view, experience has confirmed the use of Austrian pine for the Karst lands, planted on 91.6 per cent. of 1, in dense stands of 4 050 plants per acre, that is 3ft 3 in. by 3ft. 3 in. For the higher and more exposed situations Corsican pine is especially useful. Above 2 000 ft., and in sheltered positions on good soils, spruce thrives; it has been used on 4.4 per cent. Notwithstanding preference shown by the inhabitants for larch, because it does not the growth of grasses, the plantations of this tree (0.32 per cent.) give good results, nor did the few specimens of Japanese larch grown better.* Scotch pine (planted on 0.73 per cent.) does well in localities not get much snow and under covert of spruce, oak or ash. sults obtained with Banks' pine were negative. White pine is particularly useful for gapping up and for planting among other trees. White indigenous to the Karst, will play an important part in the work foresting Karst lands, especially under covert of Austrian pine and pine, and in this way about 1 190 acres have already been planted. broad-leaved trees, which are now being planted experimentally, will be an important factor in the Karst forest economy when the preliminary plantations of conifers have created suitable conditions. At present nothing can be stated about oak, but it appears that ash, sycamore, common alder and, for the improvement of the soil, white alder, even good results.

In conclusion, considering the success which has attended the work of reforestation, it is to be regretted that provisions for the consolidated economic utilization of the accomplished work should be wanting. The Ministry of Agriculture has, however, taken into consideration the proposals of the Commission as to the reform and necessity of bringing up to date the law on the reforestation of the Karst, and has recognized that the justified and opportune.

LIVE STOCK AND BREEDING.

273 - Experiments on the Efficiency of Antirinderpest Serum.

WARD, ARDISRALD and WOOD, FREDERICK WILLIAM. — *Department of Public Health, Bureau of Agriculture, Bulletin No. 19, Manila, 1913.*

The writers have made experiments with antirinderpest serum on cattle and buffaloes. Some of the serum used for inoculation was prepared by the experimenters themselves, while some was procured from the Pasteur Institute at Nha-Trang (Indo-China) and from the Experimental Station for Animal Diseases at Tokio. 175 animals were experimented upon in 11 separate experiments, 26 serving as a control and being inoculated. All the animals were exposed to the infection of rinderpest. The experiments seem to show that antirinderpest serum does not prevent infection with rinderpest. On the contrary, animals injected with serum and exposed to rinderpest soon contract the disease and pass through a more or less modified attack. It has been shown that the blood of animals is infective during this attack. If by passive immunity is meant an artificial condition by means of which the severity of the attack is lessened, the writers grant that such exists, but deny that there is a passive immunity of a kind that prevents invasion by the virus of rinderpest.

274 - Fracture of the Thoracic (Dorsal) and Lumbar Vertebrae in Horse.

RUDAU, Georg. Zur Kenntnis der Brust- (Rücken-) und Lendenwirbelbrüche bei Pferden. — *Monatshefte für praktische Tierheilkunde*, Part 5-6, pp. 193-235. Hanover, January 11, 1913.

Fractures of the vertebra in the dorsal and lumbar regions are not so frequent as those in the neck; nevertheless they form about 4 to 5 per cent of all the fractures of bones in horses. Among them the first lumbar vertebra and the sixteenth to the eighteenth dorsal vertebrae are the most frequently broken. The writer distinguishes between outer (direct) and inner (predisposing) causes. Among the first he includes: leaping, falling, colliding, getting up under the travis beam, creeping through a fence, casting for an operation, etc. The effects are all the more dangerous when the inner causes (conformation of bones and muscles) predispose the animals to fracture. The bones are often the seat of the predisposing causes. Osteological investigations have proved that the vertebrae of the back and loins are not all equally developed. The strongest are those at the extremities of the column and the weakest those in the middle. In this part also the intervertebral disks, which by means of their elasticity deaden sudden shocks, are less developed. Consequently fractures happen more frequently here. The processes of the vertebrae are more strongly built than the body and the arch; in these the spongy mass predominates over the denser compact substance; consequently fractures in the body and in the arch are more frequent than in the processes. Pathological alterations in

and lumbar vertebrae (exostoses), ossification of the intervertebral and of the articulations, rachitis, osteoporosis, etc., favour the action of agents. As further inner causes (seated in the muscles) the contractions the contractions of the long muscle of the back (*Musculus spinosus dorsi*). When horses kick violently or are cast down the spinal is strongly curved, and if at the same time a contraction of the takes place, the excessive strain upon the vertebrae causes them are or to fracture.

The symptoms are different according to whether the body or the process of the vertebrae are injured. In the latter case the spinal chord rarely, whereas in the former it does so frequently and presents the following symptoms :

- 1) Paralysis of the hind quarters (sitting position of the animals).
- 2) Dropping or retention of urine.
- 3) Perspiration.
- 4) Dyspnoea, frequency of pulse.

Symptoms accompanying fissure are :

- 1) Unsteady hind quarters.
- 2) Curved back.
- 3) Stilted gait.
- 4) The animals are capable of working (even for several weeks) the fissure turns into a fracture.

The diagnosis of fractures of the vertebral processes are easier (sensation of pain, resting position of the animal); their prognosis is also more favourable (cure is possible).

The author recommends for fissures of the vertebrae (eventually cure), tying the animals so as to prevent them lying down, and admission of phosphate of lime. Fractures of the vertebral processes are more serious; rest is necessary, as well as removal of the splinters of bone. Fractures of the body of the vertebra are incurable.

Pigments carried by Cattle.

VIES, C. J. in *Live Stock Journal*, Nos. 2024 and 2025, pp. 62 and 85-86. London, January 17 and 24, 1913.

Although a good deal of work has been done of late in investigating pigments carried by the smaller mammals, no similar investigation has yet been carried out on cattle. The writer has endeavoured to remedy this deficiency.

The method he adopted was to place a small tuft of hair in a watch-glass and a few of the same hairs in the well of a microscope slide, covering with a 40 per cent. solution of caustic potash. On the slide the process of dissolving out of the pigment could be watched from day to day without disturbing the hair; in the watch-glass the hair was microscopically examined, washed and transferred to a fresh potash solution when one pigment had dissolved out. The operation was repeated.

Three pigments were found by the above method : yellow, brown and

The yellow pigment commences to dissolve out almost immediately. The pigment takes more than four and less than nineteen hours to completely dissolve out. The solution is brick red. The pigment appears under a high magnification to be circular nucleated cells.

The brown pigment is found dissolving out from hair washed in yellow granules, but not before 29 hours after setting in potash solution. After 68 hours in all, the hair is, as a rule, free of this pigment, which the liquid containing it a pale yellowish colour. The granules of the pigment, besides being smaller, are irregularly shaped and invariably cluster together.

Black. This pigment dissolves exceedingly slowly and is difficult to isolate. Hairs with black pigment at the end of a fortnight's immersion in caustic potash appear bright brown under the microscope. The pigment granules are exceedingly small, circular in shape and do not as a rule cluster together.

The investigations bore on the hair pigments of several English breeds of cattle, and their results seem to point to the universality of certain quantities of yellow and brown pigments in every breed; traces of these are found in all the animals examined, though not invariably in every breed.

It appears thus that as cattle all carry the same three pigments, varying colours are obviously due to the respective quantities and arrangements of these pigments. It seems that yellow and black overlying gives dun; yellow only overlying brown gives yellow or red, according to the quantity of yellow present; thickly packed black and brown, when covered by a thin layer of yellow, gives black. Yellow in any quantity in the tip makes the hair "rusty".

The writer treats further of the inheritance of colour, which he illustrates by Mendelian lines, and that in general, in a cross, the darkest of pigmentation dominates over the lighter one, or rather covers it.

276 - Stock Breeding in the Kivu (Belgian Congo).

CARLIER. L'Elevage au Kivu. — *Bulletin agricole du Congo belge*, No. 3, pp. 1-12, No. 4, pp. 775-798. Brussels, September and December 1912.

The geological, topographical and climatic conditions of the Belgian Congo are by no means uniform, and for this reason the fauna and flora vary in the different parts. While the southern tribes (Babuye and Bembe) chiefly keep goats, sheep and fowls, the neighbouring Wanyabongo already domesticated the cow; among the Warundi, Watembo and Wabongo, the latter animal is generally kept, some of the natives possess herds of 1000 head.

I. *Fowls*. — These are very widely kept and are especially favoured by the Wanyabongo tribe; they are the property of the women. The fowl of the country is small, active and pugnacious; the hens lay 10 eggs before sitting. Less common is the Arab fowl, a product of the cross with Orpingtons, or other English breeds.

II. *Goats*. — Here too, this is the "poor man's cow". The writer distinguishes two breeds: the one long-haired, which yields little milk

short-haired and with good milking properties. The latter are to fatten well.

Sheep. — The management is the same as for goats. The breed and has a fat tail; it gives no wool. Sheep are chiefly used for the native markets.

Cattle. — Some of these are indigenous and others have been imported from German East Africa. Three types are to be distinguished; chiefly characterised by late maturity and a prominent hump like they are red or black. The writer distinguishes three types: Hornless cattle ("Sungu"). Height at withers nearly 4 ft.; height; ears long (about 7 ½ in.; rump and thigh well developed.

Cattle with short horns. Found where the climate is less extreme (bongo). They are larger than the cattle first mentioned. The is broad and short, the horns are directed upwards and bent forward slightly dished. The back is somewhat hollow, while the large tokens a plentiful food supply. The chest and limbs are powerful developed as is also the udder.

Cattle with long horns. Head light; horns strong, 28 to 40 inches muscular system and bones poorly developed. This is the least breed.

though no systematic breeding is practised, yet the natives are by certain general rules in breeding. As the grass in the meadows in the dry season, the herds are then driven to the often distant dleys and swampy land. They are always under the supervision Isman, who has a personal interest in the number of calves produced. inhabitants hardly take milk except as cheese. The Wanyabongo he curd spontaneously by letting the milk stand a long time, while Ruanda mix a little urine with it and the Warundi use slices of t of a citrus tree called "Nongo." Butter-milk is used chiefly ricle of food for women and children while the former use butter let preparation.

the flesh of the fowls, goats and cows is eaten by the natives, while s of the two latter are turned to account by them. The manure tied from around the huts and used for fuel or for the banana or crops.

markets ("Sokos") are held regularly at fixed places and afford an mity for the exchange of cattle, sheep and meat.

the last chapter, the writer mentions the most serious cattle diseases.

Horses and Horse-Breeding.

1-BROWN, H. K. in *The American Breeder's Magazine*, Vol. 3, No. 4, pp. 282-289, ington, October-December 1912.

a former article the writer suggested that the structure of the best rses, both trotters and runners, should be studied in their living form and from the skeleton after death as a means of establishing pd of defining types and of ascertaining which structural forms are

the most favourable to speed and endurance. The greatest difference between breeds are largely due to the structure of the skeleton. And suggests the need of an accurate method of measurement based on a unit common to all individuals. The writer recommends as a basis the height of the horse at the withers (1), which is divided into three parts denominated "heads". Each head is further divided into four parts, called "quarters," and each quarter into six parts called "minims."

These denominations are abbreviated to H for heads, N for quarters and M for minims. All the measurements of the body of a horse are given in these measures, and as the basis of all of them is the height at withers an exact representation of the proportions of the body of a horse measured with this system can be made.

The writer gives several figures further illustrating his system, and he recommends also for the measurement of cattle; but instead of taking the height of the cow at the withers it is necessary to take the length from the front of the shoulder to the end rump bone or ilium.

278 - Forage Rations for Growing Horses.

SNYDER, W. P. in *Bulletin of the Agricultural Experiment Station of Nebraska*, Vol. II Art. VIII, *Bulletin* No. 130. Lincoln, Neb., 1912.

At the agricultural experiment station of the Nebraska University foals were kept from October 1907 to January 1911 on various pastures with various winter rations. The experiment was commenced with colts, of which 16 were males, 9 mares and 7 mules; the mules, one exception, were sired by the same jack. The colts, also with one exception, were sired by a pure-bred Percheron stallion. The dams were all Montana mares.

The colts were allowed to run together in an alfalfa field from October 1907 until January 1, 1908, when they were divided into separate lots and fed as follows:

Lot 1, Alfalfa hay in winter, and alfalfa pasture in summer.

Lot 2, Alfalfa hay in winter, and prairie pasture in summer.

Lot 3, Prairie hay and cane hay in winter and prairie pasture in summer.

The grain for all lots during the first winter was 4 lbs. per head consisting of two-thirds corn and one-third oats. Later they were given a more abundant grain ration when they worked (when three years old).

(1) The height at the withers has been used by S. v. Nathusius of Halle for years as a basis in the measurement of horses; the other measures being expressed by him in terms of this basis according to the method adopted by A. Krämer and H. Lydtin for cattle measurements.

H. Krämer of Hohenheim is opposed to the use of the height at the withers as a basis for the measurement of horses.

See: S. v. Nathusius, *Pferdemessungen in Arbeiten der Deutschen Landwirtschaftsenschaft*, Parts 43, 112 and 205. Berlin.

H. Krämer, *Aus Biologie, Tierzucht und Rassengeschichte*, p. 260 et seq. Stuttgart, 1912. *Id.*, *Das schönste Rind*, III Edit., p. 31 et seq. Stuttgart, 1912. (184)

TABLE I.

Lot	First winter Jan. 1, 1908, to June 15, 1908	First summer June 15, 1908, to Oct. 31, 1908	Second winter Oct. 31, 1908, to April 21, 1909	Second summer April 21, 1909, to Nov. 2, 1909	Third winter Nov. 2, 1909, to March 18, 1910	Third summer March 18, 1910, to Dec. 1, 1909	Fourth winter Dec. 1, 1910, to Jan. 14, 1911
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
.....	152.5	244.5	5.5	181.5	20.6	39.7	77.3
.....	142.2	93.8	95.0	107.7	22.6	120.7	41.6
.....	99.5	113.5	4.5	191.0	64.8	133.3	63.0

1 and 3 lost weight during the third winter.

TABLE II.

	Lot 1	Lot 2	Lot 3
colts	10	9	10
st weight, January 1, 1908	588.5 lbs.	617.7 lbs.	617.7 lbs.
st weight, January 14, 1911	1268.4 "	1228.3 "	1157.5 "
ain	677.9 "	610.6 "	540.0 "
Grain	\$ 8.41	\$ 8.41	\$ 12.28
ed } forage	" 31.80	" 31.80	" 20.93
pasture	" 25.09	" 12.27	" 12.27
of feed per colt . . .	" 65.30	" 52.48	" 45.48
ase price	" 57.00	" 53.70	" 52.00
16 per cent. on pur- chase	" 10.38	" 9.78	" 9.47
per colt, January 14, 1911	" 132.68	" 115.96	" 106.95

was fed grain during the second winter also.

lots were composed of 11 colts and one of 10. In two of the lots there were two mule colts each and in one three.

March 1908, when the colts were not yet one year old, distemper hit those in Lots 1 and 2. Three of them died. The colts in Lot 3 were again distance from the others; they fell sick later and not severely. The colts were castrated in June 1908; when they were three years of age they were broken and worked.

The average gains per head are shown by Table I. Table II gives average weights, costs of food, etc.

The results of the experiments may be summarized as follows:

It appears that it is profitable to pasture alfalfa when the colts are as yearlings or two-year-olds, or when there is some special incentive getting rapid gains, or when the cost of alfalfa pasture and of native pasture are about equal.

Alfalfa pasture put the colts in excellent condition and produced injurious effects.

Feeding alfalfa hay in winter was profitable; it produces more increase in weight on colts than prairie hay and cane hay. In spring colts pastured when thin in flesh make better gains than similar colts put on pasture when in good flesh.

The gains in weight were greater in the first year than in the second and greater in the second than in the third year.

279 - Jersey-Angus Cattle.

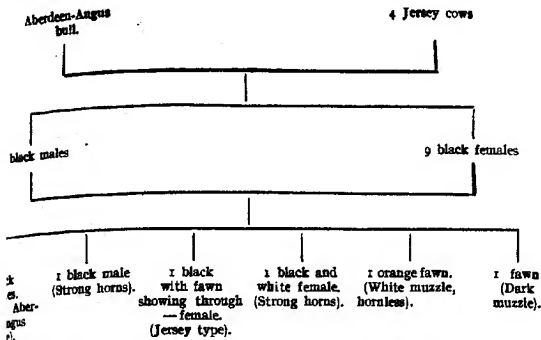
PARLOUR, WILLIAM in *Live Stock Journal*, Vol. LXXVII, No. 2025, p. 85, 1 January 24, 1913.

The writer gives an account of the results of Jersey-Angus crosses which were made in the north of England by an owner, who, finding Jerseys could not stand the severe climate of that part of the country, wished to try to combine the milkfat-producing properties of the Jersey with the flesh-producing properties of the Aberdeen-Angus breed.

The first cross, that of an Aberdeen-Angus bull with a Jersey cow, was eminently successful. The calves from such crosses were all one female only showing a patch of white near the udder. The traces of the Jersey in the udder (which is yellow, well shaped and the inside of the thighs and the ears are also covered with hair) the case with the latter breed. The females were all polled, but the males with age, usually developed embryo horns, or scurs.

A number of the cows have produced calves and all but one have been as good milkers as their dams. The steers, which were only slightly heavier than the Jerseys, have fattened readily and fetched good prices.

The first cross females have been crossed with sires of precisely the same breeding as themselves, but the offspring are of varied colour characteristics. The following table shows how the herd is progressing.



sex of the last two animals in the third generation is not given.

(Ed.).

Crosses between Algau and African Cattle.

28. Kreuzungen zwischen Algäuer und Afrikaner Rindern. — *Deutsche Landwirtschaftliche Tierzucht*, Year 17, No. 2, pp. 18-19. Hannover, January 10, 1913.

After the rinderpest had destroyed the greater number of the cattle in South-West Africa, about 10 years ago, the Government, by other measures for the encouragement of cattle-breeding, tried introducing Algau bulls.

Encouraged by the success of this attempt, Hr. Hüttenhain, a farmer, crossed between Algau bulls and the native Bechuana and Griqualand cattle. The Bechuana cattle, bred in Bechuanaland, are usually whole-colored, reddish black, red, or light with dark pigment. The height at the withers is 55 to 60 inches; the long narrow head bears well-developed horns which curve upwards like those of the Hungarian Steppe cattle. The ribs are slightly curved and the back is rather hollow. The animals are powerful behind the shoulders; the rump is very sloping. They are nearly knock-kneed and have long legs.

The Griqualand West cattle, from the Cape Province, are usually all black; they also have sloping rumps, but their horns are much smaller than those of the Bechuana breed.

Both breeds are reared only for working purposes. During their first calving period, the cows give one to two quarts of milk daily; this later increases to two to three quarts. It contains 7 to 8 per cent. of fat.

On crossing with Algau bulls, whole-colored red cows were selected. The resulting offspring had relatively well-formed backs. The head of the bull was inherited unchanged. The rump was broad and the tail set on higher. The horns had only a third of the spread of those of the Bechuana and were weaker. The colour of the heifer calves is mouse-grey, like that of the Montavon breed, but with a little dark red showing through as a pale stripe down the back, as well as light belly. The bull-calves are of a mouse-grey colour when young, but become dark in a few months; the stripe

down the back persists. All the cross-breeds had slate-grey muzzles, horns with black tips and black hoofs. Without forfeiting much their capacity for work, the animals increased in weight, while they yielded more milk, giving over five quarts after the first calf, and a quart after the second.

The above-mentioned bull was 1 $\frac{3}{4}$ year old in 1906, when born from Algau. At the present time, its descendants on Hr. Hutten farm number 150. Although seven years old, the bull is still useful in service. Like all the other Algau animals, it is well acclimatised.

With regard to the fodder supply, Algau cattle are very suitable for German South-West Africa. The best age for exporting them to Africa seems to be two years; if sent out younger, their growth is checked.

281 - Breeding Experiments with Welsh Mountain Breeding Ewes.

University College of North Wales. Bulletin VII. Bangor, 1912.

The experiments on the use of rams of various breeds with Welsh Mountain ewes, which were undertaken at the Aber Experimental Farm of University College of North Wales for the production of fat lambs, commenced again in the autumn of 1911, after a break of two years. It was found that the best butcher's lambs were undoubtedly the Southdown Welsh cross; next to these came the Wiltshire cross.

For the season 1911-12, it was determined to test these two well-known crosses against others that had not previously been tried. For this purpose, five lots of ewes were selected, 25 in each lot; these were mixed with Southdown, Wiltshire, Hampshire, Romney Marsh and Wensleydale rams. The lambs were dropped between March 4 and April 6. Particulars of the lambs are given in the following table. The lambs were usually sold to the butcher as soon as they became fat.

Lot	Description of ram	Ewe	Number of lambs dropped	Percentage of lambs sold			Average live weight of lambs when sold		
				On or before July 11	On or before Aug. 12	On or before Oct. 31	On or before July 11 lb.	On or before Aug. 12 lb.	On or before Oct. 31 lb.
I	Southdown . .	Welsh Mountain	27	81	19	—	66	64	—
II	Wiltshire		11	60	40	—	70	74	—
III	Hampshire . . .		29	67	26	7	70	67	—
IV	Romney Marsh .		26	64	36	—	73	73	—
V	Wensleydale. . .		26	54	33	13	70	74	—

It will be seen that the Southdown-Welsh Mountain cross gave the highest percentage of lambs fit for the butcher at the earliest date; but they were not the heaviest in weight.

Introduction of Karakul Sheep into Argentina.

ALBA, TOMAS R. Los ovinos Karakul. Generalidades sobre el origen y la importación al País. — *Boletín del Ministerio de Agricultura*, Vol. XIV, No. 10, pp. 1145-1178. Buenos Aires, 1912.

The Karakul breed of sheep, which has been introduced into Russia, Herzegovina, Austria, Germany and the United States, was introduced into Argentina in 1911 by means of a small flock (16 ewes and 4 rams) presented by the Emperor of Austria to the President of the Argentine Republic. The small flock is now tended with care in the "San Nicolás" establishment, Sierras del Azul, near Vela. It is intended to form a centre for raising the pure breed and at the same time to study the advantages of crossing it with the sheep of the various regions of Argentina. The writer believes that for crossing purposes the hardy native breed or "la raza" will prove the best. Should the Karakul breed become so numerous in Argentina as to become of practical importance, the writer is of the opinion that the region that will suit it best, both for the conditions of life of the inhabitants as well as for the physical nature of the country, will be the north-west of the Republic. The breeding of Karakul sheep is now being carried on in the Calchaquies valleys; in the del Toro valley in the north; in the Pampa grande, La Alemana, Inca Huasi; in the great part of the plateaus and mountains of the province of Salta, in the Tucumán valley; in almost all the mountainous region in the west of the province of Jujuy; in the Andine provinces; the pre-Cordillera region and lastly in many of the southern territories, especially in their northern part bordering on the Cordilleras. The most valuable product of Karakul sheep is the skin of the recently born or unborn lambs. These skins during recent years have attained the average price of 15s 10d and a maximum of 63s 3d, tanned. The tanned skins fetch in Buenos Aires from 34s 11d to 69s each.

Pig Feeding by means of Automatic Troughs.

PEL-FREISTATT. Schweinefütterung an automatischen Futterkästen, und deren Bedeutung für Mast, sowie Zucht und natürliche Schweinehaltung. — *Deutsche Landwirtschaftliche Presse*, Year 40, No. 7, pp. 74-75. Berlin, January 22, 1913.

It is frequently the advantage of early fattening is rendered questionable because it is attained by costly pig-sties and want of exercise. Should illness break out, or great variations arise in the cost of barley or the price of the pig-sties, being useless for other purposes, are often empty for months. The writer therefore recommends the automatic dry-feeding of pigs (1); this process offers the following advantages in fattening:

1. Special fattening sties with fixed troughs are no longer necessary; a simple space (shed, empty cow-house, barn) which has a good floor can be used to account, provided there is ample drainage.

2. Runs are easily attached to these sties.
3. A large number of animals, 20 to 100, of different ages and can be kept in such a place.

4. The pigs can eat as much as they want without wasting the food. The writer considers automatic dry feeding equally suitable for both sows and young pigs; but sows with young pigs should be given a lighter and larger run. Also the young pigs must be marked and accustomed to running about a little movement before they are placed with the others (at the age of 3 to 4 weeks). It is well to divide off a small run from the sow's pen, which should be closed by apertures allowing the young pigs access to the dry food in order that they may become accustomed to it. For about a fortnight before and at weaning the young animals must be given liquid food (skimmed milk, etc.) in addition to the dry food.

284 - The Influence of Selection on the Size of Fowls' Eggs.

Einfluss der Zuchtwahl auf die Grösse der Hühnereier. — Landwirtschaftliche Zeitschrift für Oberösterreich, Year 57, No. 2, pp. 9-10. Linz, January 15, 1913.

The Cooperative Egg-Societies of Upper Austria, which since 1905 have bought eggs by weight, have announced that their members have during 7 years increased the average weight of fowls' eggs from 1.91 oz. to 2.00 oz. by means of careful selection, good food and proper management.

The Otterbach Poultry Breeding Institution gives the following figures:

Average weight of eggs (in ounces)

Year	Partridge Italian				Golden Wyandottes			
	1-year	2-year	3-year	all ages	1-year	2-year	3-year	all ages
1905	1.86	2.04	1.95	1.92	1.83	—	—	1.83
1907	2.07	2.12	2.04	2.09	2.05	2.11	1.99	2.05
1909	2.14	2.18	2.12	2.13	2.06	2.07	2.10	2.07
1911	2.04	2.07	2.18	2.07	1.99	2.06	2.07	2.04
Average (1)	2.04	2.11	2.08	2.06	2.00	2.07	2.07	2.02

(1) In reckoning the averages, the weights of the eggs of 1906, 1908 and 1910 were included.

Proportions of the Weight of the Eggs.

Year	Partridge Italians.				Golden Wyandottes			
	Eggs of 1.76 to 1.94 oz.	Eggs of 1.94 to 2.12 oz.	Eggs of 2.12 to 2.29 oz.	Eggs over 2.29 oz.	Eggs of 1.76 to 1.94 oz.	Eggs of 1.94 to 2.12 oz.	Eggs of 2.12 to 2.29 oz.	Eggs over 2.29 oz.
.....	%	%	%	%	%	%	%	%
.....	50	50	—	—	100	—	—	—
.....	11.2	55.5	25.9	7.4	20.0	46.7	33.3	—
.....	3.3	30.0	60.0	6.7	7.1	64.3	28.6	—
.....	7.4	66.7	25.9	—	18.2	77.3	4.5	—
.....	17.2	49.5	29.8	3.5	27.9	49.3	22.8	—

Farm Flock Poultry Competition.

LE, A. A. in *The Farmer's Advocate*, Vol. XLVII, No. 1054, pp. 1634-1635 and 1702. Winnipeg, Canada, December 4, 1912.

The Norfolk Poultry Association organised in the winter 1910-1911 in Norfolk County, Ontario, a competition among the poultry flocks of farms of the district. The following were the rules of the competi-

1. No entry fee will be charged and all farmers in the County of Norfolk complying with the rules hereinafter stated are eligible for entry.
2. That only those farmers having flocks of 35 or more birds will be eligible for entry.
3. That each farmer entering the competition will keep a daily record of the egg yield of his flock on blanks furnished him by the Association for that purpose, from the first day of December 1910, till the first day of May 1911 inclusive.
4. That each farmer entering the competition will keep a financial statement, showing the kinds, amount and cost of food fed to his flock, and the total receipts from the same during the six months between the first day of December 1910, and the 31st day of May 1911.
5. That each farmer entering the competition will sign a written statement or affidavit, affirming that the record of the egg yield and the financial statement of his flock, referred to in Rules 3 and 4 and made in accordance with the foregoing, are correct statements of the truth, and that he will forward the same to the Secretary of the Association, not later than the third day of May 1911.
6. Any competitor who discontinues keeping the records referred to in Rules 3 and 4, at any time during the competition, will be disqualified.
7. All entries must be made on or before November 25, 1910.

8. The judges appointed by the Association will visit the farm of each competitor at least once, and oftener if deemed necessary, some time during the competition in order to see the flock and the management by the owner.

The competition was advertised through the medium of local newspapers and special printed matter. Twenty-two entries in all were received.

Professor W. R. Graham, of the Ontario Agricultural College, undertook the task of judging the flocks at the different farms, using the card which was set by the Norfolk Poultry Association, in which 250 points were the maximum given for the condition of the flock, 150 points for cleanliness, etc., of the fowl-house, and 450 for the management of the flock (method of feeding, care and sale of eggs, marketing of table birds, number of cocks, cocks removed from flock after breeding season, financial statement, including profit, egg-yield).

Some houses were found on inspection to be in a somewhat poor condition, others were remarkably clean. Ventilation by means of slats in the windows instead of glass was in evidence in the majority of houses.

Only three flocks of the 22 were mongrels and the breeds were of many kinds, including Plymouth Rocks, Wyandottes, Rhode Island Reds, Orpingtons, Leghorns and Minorcas.

At the conclusion of the contest, the competitors sent up their report to headquarters and a meeting for the purpose of encouraging improved measures of poultry keeping was held at the county seat.

Table I gives a summary of the costs and profits of the individual flocks:

TABLE I.

Number	Breed	Number of hens	Grain per hen per month lbs.	Cost per hen per month cents	Eggs per hen per month	Profit per hen per month cents
1	Plymouth Rock	50	7.5	9.0	11.7	57.24
2	"	39	6.3	7.5	13.2	93.3
3	"	52	6.3	7.7	8.0	32.6
4	"	49	5.4	8.0	10.5	59.0
5	"	70	5.9	5.4	4.1	4.31
6	Leghorn	95	4.9	8.2	16.6	135.2
7	"	85	5.3	7.1	12.9	89.9
8	"	58	5.1	6.0	10.0	37.8
9	"	126	4.2	7.5	10.9	66.0
10	"	90	5.7	5.5	7.2	34.1
11	"	87	5.0	5.1	8.3	46.6
12	"	85	5.6	5.7	10.1	64.1
13	Wyandotte	35	8	10.7	16.05	73.9
14	"	140	7.6	8.4	7.4	20.5
15	"	69	7.2	9.8	8.4	24.4
16	Cross bred	70	5.6	6.06	8.9	48.4
17	"	51	9	9.3	11.3	53.7
18	"	48	5.4	6.6	10.7	89.9
19	Orpington	114	5	7.4	8.3	45.5
20	Rhode Island Red	45	5.2	5.5	11.9	86.8
21	Minorca	70	7.8	9.0	10.0	41.4

profit, i. e. the amount received for eggs above the cost of feed, six months from December 1 1910 to May 31 1911, averaged for 21 flocks 57.67 cents per hen, or 57.67 dollars per 100 hens. The ults (\$1.97) were obtained by No. 6, the flock which won the com-

e of the competitors continued their records till December 1, the results are given in Table II.

TABLE II.

Breed	Number of hens	[Grain per hen per year lbs	Cost per hen per year cents	Eggs per hen per year	Profit per hen per year cents
Plymouth Rock	50	63.4	78.0	128.2	104
Leghorn	95	50.4	77.5	157.4	197
"	58	50.4	60.0	123.2	119
Orpington	114	49.5	70.0	85.5	85
Rhode Island Red	45	53.	58.8	124.8	115

e writer further sought to discover the cause which determined the pleness of the different flocks, and came to the conclusion that this to be found so much in the breed, as in the feeding and manage- f the fowls. The best results were obtained where the flocks were uttermilk and green food, and where the fowl-house was well ven- Further figures are given in support of this view.

Methods of Protecting Fish Ponds from Frost.

KING, H. Vorbeuge vor Frostschäden in der Fischerei. — *Deutsche Landwirtschaftliche* 34, Year 40, No. 3, p. 27. Berlin, January 8, 1912.

ie layer of mud which covers the bottom of lakes and ponds is in inual state of decomposition, thereby giving rise to marsh gas, retted hydrogen and ammonia. When the pond is frozen, these r less poisonous gases pervade all the water and adhere in the form bles to the lower surface of the ice. If the ice is covered with snow, t the light cannot reach the water, the microspic water plants are to absorb ammoniacal nutritive substances and to give off oxygen. n as the supply of oxygen in the water is exhausted the fish thus from suffocation.

order to prevent, or remedy, this want of oxygen, the writer sug- the following methods.

he pond in which the fish pass the winter should under no circum- s be overcrowded. Fish should not be kept through the winter ds where the mud stratum is more than from 8 to 12 in. thick; circumstances necessitate the use of such a pond, it must be left om the month of August, at latest, until the time for stocking it. llows the mud to settle and the acids to escape from the surface. plication of phosphate of lime to the soil is much to be recommen-

ded. Moor ponds should be dragged in autumn or summer with a d or heavy rope, to facilitate the rise of poisonous gases.

When the water freezes, the supply and discharge channels sh be kept constantly open. If, however, the water supply is insuffi it is necessary to try to get rid of the decomposition gases by drag to and fro under the ice a so-called "Strohleine" (a rope furnished w wisps of straw at intervals of a yard). The rope can also be weight drawn along the bottom, so that the gases may rise and escape thro the ice-holes. At the same time, the surface of the ice should be l as free from snow as possible, so as to allow of the development of small green algae and cause them to give off oxygen.

The appearance of different water insects in the open supply char of the pond is a sure sign of the water becoming foul. First comes *risa*, which is followed soon by *Nepa cinerea* and *Notonecta glauca*. the pond weeds on which these insects pass the winter have already composed, they seek oxygen in more wholesome waters. If no suit remedy is found, during the next 24 hours *Ranatra linearis* makes warning appearance. The advent of *Hydrophilus piceus* denotes t the greater number of the fish are congregated round the edges of the p beneath the ice seeking in vain for water richer in oxygen and are tined there to perish miserably.

287 - Experiment in Feeding Carp on Acorns at Trachenberg, Germ

HEROLD, R. Eichelfütterungsversuch in der Teichwirtschaft Trachenberg. — *meine Fischereizeitung*, Year 38, No. 3, pp. 60-61. Munich, February 1, 1913.

This experiment was made by the writer last summer. Carp, summer old, were placed in a pond badly supplied with nutritive s tances, and fed for three months exclusively upon crushed acorns. fish remained healthy. They were weighed before and after the exp ment.

Results: 8.85 cwt. of crushed acorns, costing 8s. 10d. deliv at the pond, produced 1.9 cwt. of fish for the table.

FARM ENGINEERING.

288 - Watzl's Regulator for Ploughs.

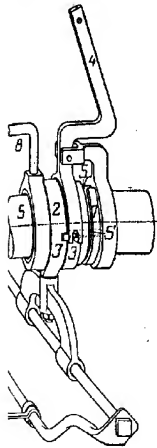
REZEK, I and RICHTER, L. Pflugführung Watzl. K. k. Hochschule für Bodenkultu. I fungstation für landwirtschaftliche Maschinen und Geräte. — *Wiener Landwirtschaftl Zeitung*, Year, 63, No. 3, p. 27. Vienna, January 8, 1913.

The regulator for ploughs shown in the annexed figure is used as l lows:

The hollow cylinder 5 is fastened by means of the set screw 8 on t more or less cylindrical beam of an ordinary plough, while the shaft 12 is fastened anyhow to the wooden or iron fore-carriage of the ploug

The regular working of the plough is based on the fact that the n bearing 2, in which the above-mentioned hollow cylinder 5 is borne, bei

the fore-carriage, cannot revolve round the axis of the beam; the position shown in the drawing the rotation of the cylinder 5 (and consequently the rotation of the plough beam) is prevented by the ring 3, which works in the groove 5' of the cylinder 5 by means of the small springs 3' and is coupled to the bearing 2 by the butt ends of the springs 3' catching in a notch of the bearing 2.



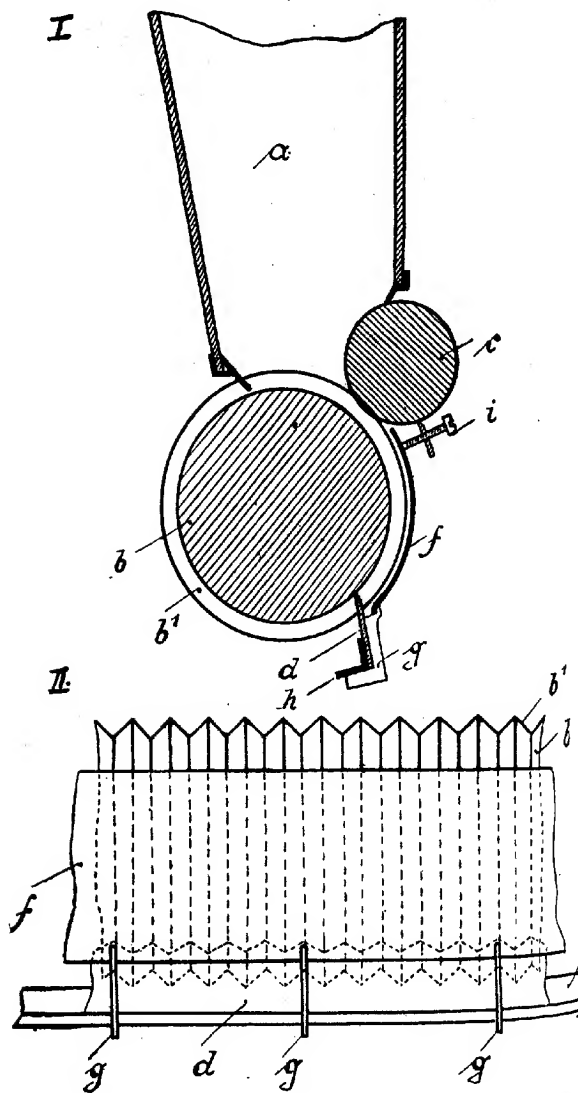
This coupling of the ring 3 with the bearing 2 is maintained, while the plough is working, by the spring 7 which presses the ring 3 against the bearing 2. When the plough reaches the end of the furrow the lever 4 is pulled by means of a string, the other end of which is fastened to the handles, and overcoming the resistance of the spring 7 the ring 3 is pushed so far forward as to be released and free to turn with the hollow cylinder 5 and the whole plough beam. Thus the plough can be turned over as is usually done at the end of the furrow.

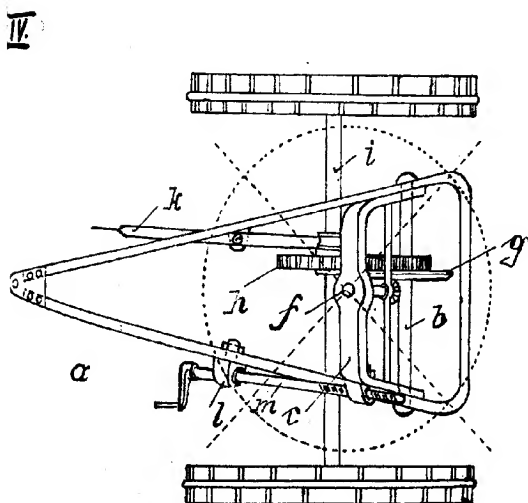
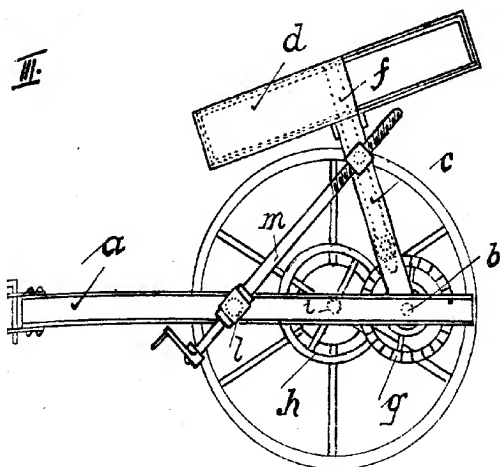
When a new furrow is started the ring 3 automatically with the bearing 2.

Experiments have demonstrated that even imperfect wooden ploughs, composed of parts not really belonging together, if provided with a regulator can be made to proceed as evenly in the furrow as the best modern iron ploughs, thus greatly facilitating the work of the farmer where modern implements have not yet been introduced. The writers believe that this regulator can be still further simplified without impairing its efficiency.

Distributors for Solid and Liquid Manures.

neuen Patent-Schriften. — *Landwirtschaftliche Maschinen und Geräte*, 12th Year, pp. 21-22; 13th Year, No. 1, p. 19. Artern, December 28, 1912, and January 4, 1913. The essential merit of this machine, the subject of two patents in Germany, consists in the even distribution of manure. Figs. I and II show a distributor for solid manures, in which the uniformity of distribution is effected by means of a concave case which covers the distributing roller at the point at which the fertilizer falls onto it from the hopper, to the ground. The space between this case and the roller can be increased or decreased so that the quantity of manure can be regulated. The manure in the hopper (a) falls on the grooves (b') of the roller (b), and it is carried to the scraper; this rubs off the manure which has pressed into the grooves by the counter roller (c) and allows it to fall ground.





In the figure the case is shown in (f) and a bar of angle iron in (g). This bears an angle of sheet iron (h), to which the case is attached. Set screws (i) serve to regulate the position of the case.

Figs. III and IV show the distributor for *liquid manures*, in which the distributing disk can be given different degrees of inclination to the face of the ground. This distributor consists of a frame (a) bent U-shaped support (c), which, by means of the shaft (b), pivots on the frame. It carries the shaft (f) of the distributing disk. This shaft is caused to revolve by the spur gears (g) and (h), which are connected with the driving axle (i) and thrown into or out of gear by the lever (k). With the aid of shifting the position of the support (c), a swivel bearing (d) in which the worm shaft works, is attached to the frame.

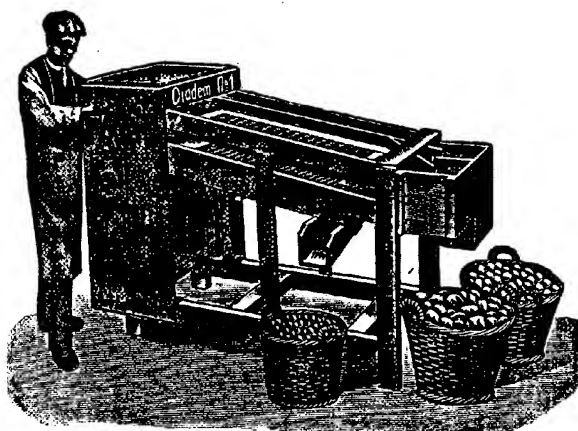
The worm shaft (m) is provided with a crank handle at its lower end and with a worm at its upper extremity working in a swivel nut (n) on the support. By causing the shaft (m) to rotate by means of the handle, the U-shaped support (c) turns on the shaft (b) and alters the inclination of the distributing disk. At the same time the worm shaft affords stability to the support, which cannot shift by itself, and allows the gears to run smoothly.

290 - Report of the Machine Experiment Station of the Agricultural Association of Prussian Rhineland on the Potato-sorting Machine "Diadem No. 1."

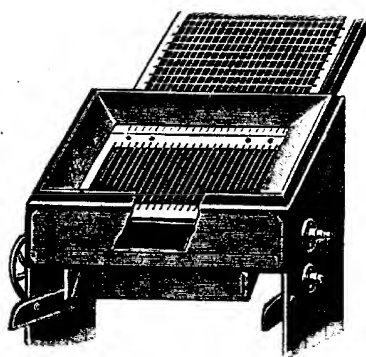
GIBSELER, E. Prüfungsbericht der Maschinenprüfungsstation des landwirtschaftlichen Vereins für Rheinpreussen über die Kartoffelsortiermaschine, "Diadem" Nr. 1. - *Landwirtschaftliche Presse*, Year 40, No. 9, pp. 102-103. Berlin, January 29, 1913.

The machine shown in the two annexed figures was tried twice. It is easily transportable, a strong boy can work it easily and its feed height is at a convenient height. Most of the earth falls before reaching the sorting sieves through a swinging screen at the back of the machine, over a wooden gutter which at the same time protects the shaft and the gears. The riddles thus remain clean for a long time, unless the earth coming to the potatoes is particularly sticky. The riddles are besides easy to clean and to change. Under normal conditions the machine gives about 5 tons of potatoes per hour, that is, as many as two workmen can feed to it. The potatoes fall well sorted into three grades into bins. The construction of the machine is solid and durable, and the arrangements for lubrication are convenient.

The working of the machine is the following: By turning the crank handle a set of geared wheels transmits motion to a horizontal shaft which goes right through the wooden frame of the machine. In the middle of this shaft is bent to a crank bearing one end of a connecting rod, the other end of which is fastened to the lower screen, causing it to move forward and backwards. The upper end of this screen is borne by two oscillating wooden springs fixed to the lower bars of the frame, while its lower end is supported by the lower arm of a vertical lever pivoting round its upper end. The upper arm of this vertical lever bears the lower end of the upper screen.



1



2

pend of the upper screen is also supported by two oscillating springs. By this arrangement the two screens move always in opposite directions and shocks are reciprocally neutralized.

**Trial of the Hand Power Separator "Lacta 2," of the Machine
Bridge-building Company, Helsingfors, Finland.**

By I. and WINKLER, W. Prüfung der Handmilchzentrifuge "Lacta 2" der Maschinen-
Brückenbau. A.-G. Helsingfors, Finland. K. k. Hochschule für Bodenkultur. Prü-
fungstation für landwirtschaftliche Maschinen und Geräte. — *Oesterreichische Molkerei-
Zeitung*, Year 20, No. 12, pp. 22-24. Vienna, January 15, 1913.

In the construction of the separator under examination the following
was noticed: The drum consists of two parts, united by a ring and
made watertight by a rubber ring. The bottom of the drum, which is
in the centre, ends in a hollow cylinder which receives the end of
the spindle, and on which the drum rests in such a way that its centre of
gravity is lower than its point of support; it can thus balance freely, while
rotating, on the end of the shaft. For this object the spindle head is pro-
vided with a metal cap AC (see figs. 1 and 2) fixed to it by a pin, which
allows it to revolve with the spindle, but allows it sufficient play room,
the outer surface of the cap fits tightly in the hollow space at the
bottom of the drum. The central tube through which the milk is fed is
located immediately above the cylindrical part of the bottom of the drum,
at which the tube ends in a foot plate with three channels by means
of which the inflowing milk is led to the neutral zone. Next follow 22
cones placed one above the other which at the top completely en-
close the central tube. The whole set of cones is pierced vertically in three
places which allows the milk to ascend and to spread between the conical
plates, besides which they have three smaller openings on their flattened
edge in order to allow the cream to rise. The set of cones are at a
distance of 4 millimeters from the side of the drum and are covered by
a cone which embraces the central tube by means of a strong cylin-
drical support, and bears on its flat edge inclined inwards two outlets for
the cream, the openings of which can be regulated by means of screws.
The skimmed milk issues by the three grooves in the cylindrical support
of the upper cone, which convey it over the edge of the drum cover above
the upper cone, whence it flows by centrifugal force.

The bearing consists of a strong brass socket which surrounds the
drum and which in its turn is held by a strong spiral spring.

The gearing shown in fig. 3 presents two novelties for separators.

The usual simple spur wheels are replaced by skew wheels, which
have the advantage of diminishing friction and of working noiselessly.

The intermediate shaft of the drum shaft is connected with the worm
driven by means of a spring friction coupling, and the play room of the
intermediate shaft is so small that by the motion of this
shaft in one or the other direction it is immediately and automatically
brought into or out of gear.

The power required to work this separator was calculated by means of an electric method and also by Leuner's spring dynamometer.

Altogether 10 tests were made with the separator, the results were tabulated in the paper. They show that working under normal conditions the amount of butter-fat remaining in the skimmed milk is only 0.09 per cent., which is a very good separation.

When the number of revolutions was diminished by about 20 per cent. the intensity of separation changed but slightly and was satisfactory at the low milk temperatures of 20° to 23° C. (68 to 73. 4° F.), the fat content of the skimmed milk not exceeding 0.14 per cent.

The noise produced by the machine when at work is very slight, the design of the separator is simple and suitable and it is carefully constructed. It does not require any particular skill to dismount, to remove or to clean it, all of which can be done in a few minutes. In view of the results the separator was pronounced to be an excellent machine.

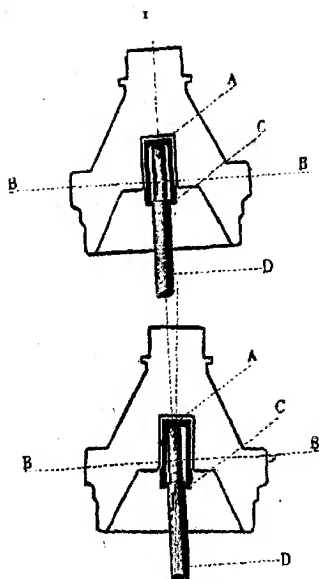
292 - A New Machine for the Extraction of Rubber from Bark.

JUMELLE, H. Une nouvelle machine pour l'extraction du caoutchouc des écorces. *Caoutchouc et la Gutta-percha*, Year 9, No. 106, pp. 6780-6783. Paris, December 13, 1906.

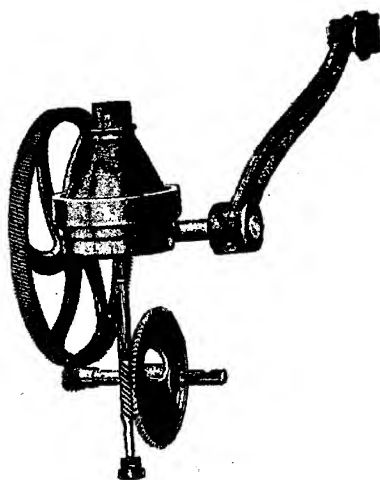
The extraction of rubber from bark by trituration is not to be recommended in the case of all rubber-producing trees, although it is an excellent method to apply to lianes in general and also to such trees as yield only small quantities of latex when tapped.

The writer describes a new machine, "la Valour," which simplifies the operation being carried out more rapidly, regularly and completely than when the material is crushed by hand in mortars. The apparatus consists of an iron cylinder driven by some kind of motor. The necessary force is about 3 H. P. The cylinder, which is placed horizontally, is pierced with numerous holes. Inside are about five strong rollers, each weighing 37½ lbs., and with a length almost equal to the cavity of the drum. These rollers are free, and when the drum moves at the approximate rate of 45 revolutions per minute, these rollers of iron fall onto each other and also against the sides of the drum, acting in fact like the pestle in a mortar. If a certain quantity of bark is introduced into the cylinder it gets finely crushed. A stream of water which passes through the perforations in the wall, removes the dust of the pulverised bark, while the pure rubber remains in the drum and is then removed, carefully washed in hot water and formed into sheets by strong pressure. This machine can also work without water; in that case, the pulverised bark issues from the holes made in the drum for that purpose. The apparatus can be taken to pieces and thus transported on the backs of men or animals.

The cylinder is capable of containing 70 lbs. of bark. The weight of rubber obtained in the course of an experiment made with the bark of *Landolphia Thollonii* represents 10 per cent. of the weight of the bark. It was of a maximum degree of purity, and only contained 1.15 per cent. of ash, which is much less than in the case of rubber obtained by



2



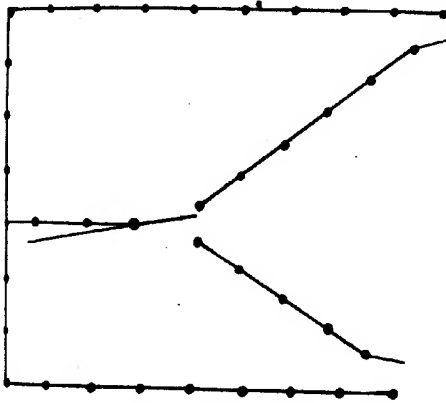
though it is a great deal more than results from the coagulation of latex. The somewhat spongy appearance of the section is due to the method of preparation and would become perceptible if the block were submitted to hydraulic pressure.

The writer considers that this machine produces in the minimum as fine and pure a rubber as can be obtained by trituration. This can be expected, as this kind of rubber is one which can only be obtained by this direct extraction.

Cutting-Out Gate for Hogs.

E. H. A. in *The Breeder's Gazette*, Vol. LXIII, No. 2 (1924), p. 79. Chicago, January 13.

As shown in the annexed figure, two wings of fence lead up to the opening cutting-out gate. This opening is 2 feet wide. The gate is 4 ft. wide on a post, as on a pivot, so it swings easily from side to side of



the opening. From the top of the gate a pole extends backwards 10 feet, by which the gate is swung. It should be far enough back so that when animals approach the gate they will not be frightened by the pole. The gate stands there to work it.

This is a simple device and not expensive and has been found a great practical use in separating hogs.

RURAL ECONOMICS.

294 - Grazing or Stall-Feeding on High-Moor Farms.

SOBOTTA. Die Zukunft im Hochmoor, *Waldwirtschaft oder Stallfütterung?*—*Landwirtschaftliche Zeitung*, Year 61, Part 24, pp. 826-852. Stuttgart, Decem

Owing to the good water supply on high-moors, the owner of the est farm in these districts has free choice in the selection and distribution of his cultivation methods and can plough the land or lay it down to as best suits the size and requirements of his property. Meadow and pasture cultivation on the high-moors has made considerable progress in recent years. High-moor pastures give as good a yield of grass as marsh pasture and even proved superior to the latter in the droughty year 1911. The average hay crop per acre on the high-moor meadows is reckoned at 2 tons, and the average increase of live weight of cattle on the pastures at 2 lbs. per acre. The value of the yield of an acre of meadow land is: 2 tons at £3 = £6; and that of pasture land is: 262 lbs. increase of live-weight about 5d = £5 5s. As the extra value of the hay crop is counterbalanced by the higher cost of labour, the yield of meadows and pastures is equal; thus if the question of returns is to decide the matter, there is nothing to choose between them.

The high-moor can therefore provide grazing land as well as supplement stall-feeding. Thus the high-moor farmer can turn his attention to pasturage and fattening and breeding cattle in the open, or stall-feed the animals, either for the butcher or for dairy purposes; he can also select a middle course combining both methods.

In order to show that the two types of farming are equally profitable, the writer cites the examples of two farms of the Wörpedorf moor Colony on the Teufelsmoor in the district of Osterholz in Hanover. These farms are numbers 42 and 33 Wörpedorf. The areas under cultivation on the two farms are divided as follows:

	Wörpedorf 42	Wörpedorf 33
	acres	acres
Arable	13 ½	14
Meadow	13 ½	18
Pasture	13	3
Total area under cultivation . . .	40	35

Thus on W.42 the proportion between arable land, meadow and pasture is 1:1:0.95, and on W.33, 1:1.29:0.22. These figures show the difference between the systems of the two farms: W.42 is a high-moor farm, divided equally into arable land, meadow and pasture; on W. 33 there is relatively little pasturage, so that stall-feeding is indicated for the cattle there.

comparison of the receipts and expenditure of both farms gives differences which result from the two systems in the sale and purchase of cattle, sale of products, purchase of foodstuffs and manure, etc.

a) W. 42.

<i>Receipts.</i>		<i>£ s. d.</i>
221½ cwt. of potatoes at about 2s.		22 0 0
61½ qts. of milk daily (carriage deducted) at 7½d. per gal.		172 17 6
1 in-calf heifers and 2 discarded cows at £22 1s.		88 4 0
4 calves at £4 18s.		19 12 0
10 fat pigs of 200 lbs. at about 50s. per cwt.		352 16 0
12 700 cub. ft. of peat		88 4 0
Pasture rent for outside cattle		4 3 0
Landries, garden, poultry, letting out vehicles.		8 16 6

Total . . . £756 13 0

<i>Expenditure.</i>		<i>£ s. d.</i>
cows (substitutes) at £22 1s.		44 2 0
10 young pigs (substitutes) at 11s. 9d.		52 17 6
Depreciation of 2 plough horses, worth £29 7s. 6d. each, at 10 %		5 17 6
1 Crushed barley and fodder meal		205 15 0
1 Brewer's grains		20 11 0
Seeds		4 17 6
Chemical manures		14 12 6
Wages :		
a) farm servant: wages £24 10s.; keep £19 15s.		44 5 0
b) day labourer : 150 days at 2s. 6d., 150 days at 1s. 3d.		27 15 0
c) maid : wages £8 16s. 6d.; keep £15 16s.		24 12 6
d) Piecework in turf-cutting, harvesting, and like expenses		39 5 0
Rent of meadow		1 0 0
Depreciation of buildings, worth £490, at 5 %		24 10 0
Depreciation and maintenance of live and dead stock		24 10 0
Insurance premiums, various expenses, risk.		68 12 0

Total . . . £603 2 6

Receipts thus exceed the expenditure by £153 10s 6d. If the value of the work done by the farmer and his wife is taken to be worth £53 5s + = £ 61 15s, a net revenue of £91 15s 6d is gained; at 5 per cent represents a capital of £1835 10s, while the owner according to his books owns property and his stock at £1702 7s 6d.

b) W. 33.

<i>Receipts.</i>		<i>£ s. d.</i>
5 cwt. of potatoes		23 10 0
Gallons of milk daily at 6¼d.		296 7 0
4 cows at £23 10s.		94 0 0
2 fat bullocks at £24 10s.		49 0 0
4 calves at £4 18s.		49 0 0
10 fat pigs at about 50s. per cwt.		352 16 0
1000 cub. ft. of peat		117 12 0
Leasing of buildings and land		9 16 0
Landries, garden, poultry, letting out vehicles		8 16 0

Total . . . £1000 17 0

<i>Expenditure.</i>		<i>£ s d</i>
1. a) 4 in-calf cows at £24 10s.		96 0 0
b) 2 bullocks for fattening at £12 5s.		24 10 0
2. 90 young pigs at 11s. 9d.		52 17 6
3. Depreciation of 2 ploughing horses, 10 % on £58 15s.		5 17 6
4. Feeding stuffs		382 5 0
5. Seed		7 7 8
6. a) Chemical manures		4 18 0
b) Pig dung		2 9 0
7. Labour :		
a) 2 farm servants at £44 5s.		88 10 0
b) 1 maid		24 12 0
c) Labour for cutting peat ; harvesting, etc.		44 2 0
8. Rent of meadow		2 0 0
9. Depreciation of buildings, worth £656 10s., at 2 %		13 0 0
10. Depreciation and maintenance of live and dead stock		24 0 0
11. Insurance premiums, various expenses and risk		68 1 0
Total	£343 12	

These receipts thus exceed the expenditure by £157 4s 6d. If labour of the farmer, his wife and mother are valued at £35 5s + £26. £13 5s = £ 75, there is a net revenue of £82 4s 6d, which, at 5 per cent represents capital to the amount of £1644 10s.

This comparison clearly shows that two neighbouring high-moor farms of which the conditions are similar, can develop very differently and give the same results from the cultural and the financial point of view.

The simplicity of the management, the little labour required, the agricultural risks and the relatively more certain provisions, are all factors which incite the farmer who has learnt what hard work is involved in farming, to imitate the marsh farmer in depending chiefly on pasturage, especially since good and remunerative pasturage can be established on high-moors. The weak side of this system is less apparent. Where pasturage is the chief industry of the farm, it is very difficult to keep cattle intended for fattening through the winter and to obtain sufficient animals to fill up the vacancies, when it is desired to use home-bred stock of which the disposition and qualities are well-known. To provide for the animals throughout the winter entails the purchase of large quantities of concentrated food ; this makes the profits accruing from the system very doubtful.

To these difficulties must be attributed the general division of stock-raising labour between the east and west districts in Germany. The animals bred on the western pastures — cows in calf, heifers and young cattle which have to be removed at the close of the grazing season, mostly to winter quarters in the eastern provinces, especially on estates where cultural industries are carried on (distilleries, factories of starch and so on). The landowners of the eastern provinces often find it difficult to keep sufficient cattle during the winter to utilize the waste products from the distilleries, as the extent of pasturage is not great; on the other hand, a

devoted a large area to the cultivation of fresh fodder would not be able.

From the standpoint of national economy, this division of labour is important, as the production of meat is thereby regulated. The pastures furnish the greater part of the butcher's beasts from late summer (August) to the end of autumn, while the winter-feeding farms supply from December on into summer. The annual meat supply is thus evenly apportioned and great fluctuations in price are avoided.

During the last few years, large areas in the eastern districts have been given over to pasture, especially in parts where extensive low-lying moors

Thus the east will in the near future be independent as regards feeding young cattle and butcher's beasts in the summer. If the western districts devote themselves continually more exclusively to maintaining extensive pasture-farming, to the exclusion of stall-feeding, this will lead on the one hand to ill-timed overproduction and on the other to a rapid decline in the supply, with the result that there will be a great disproportion between the supply and demand and much fluctuation in the prices on the market. Thus from the point of view of national economy, it is necessary to determine the purpose to which the high-moors are to be put, so that there are still extensive moorland tracts uncultivated in North-Germany.

High-moors combine the most suitable conditions for grazing and for winter-feeding. They can be cultivated to raise not only cereals suitable for bread-making, but also hay and root crops sufficient to form a good basis for winter feeding. It must be remembered that a stock-raising farm can only prosper if the crops and meadows provide the whole winter supply. So far, the labour question has given no trouble; in fact, on the average only 27 acres in extent, the farmer and his family are able to do all the necessary work. In such farms under extensive cultivation, the brothers and grown-up sons of the proprietor cannot find steady and remunerative work upon it and, like other members of the household, will be driven to seek employment in town industries. Even extensive cultivation, even over large areas, can only provide food and lodging for a relatively small number of people. But a system of cultivation which includes tilling arable land and keeping cattle in the stall, better promotes the circulation of large quantities of food (grain, potatoes, milk, meat) than a system which is based on extensive grazing and where the whole aim is limited to the production of meat. From what has been said, it is evident that the best way of cultivating high-moors is to divide them equally and systematically into arable fields, pastures and pastures.

The Profitableness of Artificial Manuring.

Rentabilität der Kunstdüngung. — *Land- und volkswirtschaftliche Mitteilungen*, Year XI, No. 2, pp. 19-20. Jena, January 15, 1913.

The bookkeeping and farm department of the German section of the Imperial Council of the Margravate of Moravia, under the direction of

Dr. Ostermayr, has, by means of careful bookkeeping in a number of Moravian peasant farms, established the profitableness of using artificial manures. For this purpose the farms were divided into five groups :

Group I. Farms which use nitrogenous, phosphatic and potash manures.

Group II. Farms which use nitrogenous and phosphatic manures but no potash.

Group III. Farms which use phosphatic and potash manures but no nitrogenous manures.

Group IV. Farms which use only phosphatic manures.

Group V. Farms which do not use artificials at all.

Complete manuring exerted the greatest influence on cereals. The heaviest crop was 1568 $\frac{1}{2}$ lbs. (26.1 bushels per acre), and it belonged to group I. From group I to group V the amount of crop harvested diminished steadily. Among cereals, rye and oats followed regularly this order, the heaviest wheat crop was met with in group IV (exclusively phosphatic manure), and the heaviest barley crop in group II (phosphoric and nitrogen). It follows that rye and oats have by far the greatest need for plant food, while wheat and barley, which occupy a better place in rotation in regard to dressings of dung, and, owing to their requirements, are grown on better soil, show less sensibility to the action of artificial manures.

The fact that the lowest returns per acre are recorded in group V, one without artificials at all, proves that the use of artificials is a determining factor in the increase of returns. A comparison with group IV shows that it is especially a question of the supply of phosphoric acid. Dr. Ostermayr believes accordingly that the intensive use of this plant food is unhesitatingly recommended to every Moravian farmer.

The net returns per acre were as follows :

Farms that did not use phosphoric acid	£1 15s 8d
" " " " nitrogen	£2 8s 2d
" " " " potash	£2 15s 6d

Consequently the least reliable in their effects on the increase of returns are the potash manures.

Dr. Ostermayr also grouped the farms according to the quantities of the various artificials employed, and found that an increased consumption of nitrogen and phosphoric acid has the effect of increasing the net returns, but that the reverse is the case with potash manures : the more considerable the quantity of potash given, the lower the net returns. From observation it does not follow that manuring with potash is never attended by success, but that the most advantageous quantities of manures employed, and especially of potash manures, must be determined in each farm by means of careful experiment.

296 - Cost of Making Boef.

The Breeder's Gazette, Vol. LXIII, No. 2 (1924), p. 81. Chicago, January 8, 1924.

The lot of oxen which was exhibited at the International Exhibition of 1912 in the short-fed class and won championship honours were the following:

Feb. 3, 1912 these cattle, weighing 950 lbs. each, were purchased at \$25 per 100 lb. and were fed no grain before August 12. From February 3 to April 10 the feed consisted of rather coarse timothy hay and fodder taken from about 2 1/2 acres of corn. On April 7 the cattle were moved on 60 acres of good bluegrass pasture with a good deal of old alfalfa left from the previous season. Here they remained without any supplemental roughage until August 12. Two snow storms during April made it necessary to bring the cattle up to feed for a few days. On August 12, after twelve hours off feed and water the eighteen steers averaged 1,250 lbs., showing a gain of 258 lbs., since February 3. During the first half of the feeding period, the cattle had access to 40 acres of pasture on which a crop of hay had been taken, and the grain consisted of cracked corn, spelt and oil meal. A full feed was reached in about two weeks and practically no steers went off feed. If they showed an inclination to lose appetite, molasses feed was added to the ration. The gradual change from old to new corn commenced on September 16. During the last thirty days the cattle received 5 1/2 lbs. of oil meal per head per day. Complete figures follow.

Cost up to August 12.

18 steers, av. 950 lbs. at \$5.25	\$	897.84
2 1/2 acres corn fodder at \$20 per acre	"	50.00
10 tons hay at \$10 per ton.	"	100.00
60 acres pasture at \$4 per acre	"	240.00
Interest on investment at 6 per cent.	"	53.87

Total . . . \$ 1,341.71

Feed bill August 12 to November 30.

52 bu. spelt at 30 c. per bu.	\$	15.60
4 tons oil meal at \$33.50 per ton.	"	134.00
335 bu. cracked corn at 75 c. per bu.	"	251.63
587 bu. new corn at 40 c. per bu.	"	234.90
1 1/2 ton molasses feed at \$26.50	"	39.75
Pasture, August 12 to October 10	"	20.00
1 ton alfalfa hay at \$16 per ton.	"	16.00
Corn stover	"	10.00

Total cost to November 30 . . . \$ 2,063.59

Proceeds.

15 steers, 22860 lbs. at \$10.70	\$	2,446.02
3 steers, 4,660 lbs at \$10.75	"	500.95

Total . . . \$ 2,946.97

Commissions and charges . . . 131.00

Net proceeds	\$	2,815.97
Premium won	"	300.00

Total . . . \$ 3,115.97

Cost	"	2,063.59
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Net profit . . . \$ 1,052.38

297 - Land Valuation.

EICHMOLTZ, TH. Bodenschätzung. — *Deutsche Landwirtschaftliche Presse*, Year No. 7, pp. 73-74; No. 8, pp. 83-84. Berlin, January 22 and 25, 1913.

After a short explanation of the terms: value based on net returns, value and common value of land, and of the connection between the writer discusses the question of valuation in the rounding up of land by exchange (*Zusammenlegungsverfahren*). The general commission practise the exchange of pieces of land in the rounding up of property according to the values based on returns. According to the writer the special properties of the soil and the distance from the farm houses receive sufficient consideration from this method of valuation. A great inconvenience is that complaints against the distribution of the pieced land are again judged according to the same principles which gave rise to the complaints.

These evils could easily be avoided if the soil were examined according to the geologico-agricultural maps and if the market value were considered as the measure of value in these exchanges. This latter value contains in itself the distance, the position, the agricultural and technical possibilities, and all the other properties of the soil that determine its value.

The valuation of land must take into consideration two principal points, namely that the agricultural value of the new pieces of land should be in proportion to that of the old ones, and secondly that the personal property of the owner, expressed in common value, should suffer no loss.

According to the data furnished by the chief land surveyor in the third report (1912) of the Bavarian *Flurbereinigungskommission* the most desirable land valuation, from a theoretical point of view, would be the one which would contain in one single number all the factors which determine the current value of the piece of land, in just proportion to the other pieces in the region undergoing the rounding off of property means of the exchange of outlying fields. A valuation in figures which takes any factor determining the value and does not consider it in some way in the exchange of fields, cannot satisfy the condition that every one who takes part in these exchanges must receive full compensation for the land he gives up.

If use is made of the market value in such valuations, it is obvious that the same market value cannot be used throughout the whole operation. With the new arrangement a new market value arises. This value is called by the writer the transition value. This transition value, even after deduction of the contributions for works made in the common interest such as roads, ditches, etc., will be higher than the original value of the field. As this difference in value is divided equally among all who part in this exchange, which with the present way of proceeding is the case only to a small extent, the equity of the method will be recognised by the landowners and their confidence in it will increase. It is only by this method, allowing the increase in the value of the land to be expressed in figures, which can give a just measure for the division of the cost of the operation.

valuing according to the market value, it is to be noted that the market value V consists of the product of the geological-agricultural-geographical value G , by the factor of the vicinity to the farm buildings N , and farming power of the owner, O ; therefore:

$$V = G \times N \times O; \text{ and } G \times O = \frac{V}{N}$$

purely agricultural districts O , (excepting on leased lands) may be considered as almost everywhere having a constant value. Where, however, industrial influences or the neighbourhood of building sites act upon the soil, a new factor I appears; consequently $V = G \times N \times O \times I$, and in valuing the values on the maps the influence of the factor I will show itself about the value $G \times N \times O$. The determination of these belts is important, both for the rounding up of properties and for expropriations. In using of this method, the value of the influence of industrial centres I is calculated, as $I = \frac{V}{G \times N \times O}$; and with the help of this the difference between the industrial and the purely agricultural value of the plots is found.

In determining the market value of land, in spite of the abundance of available material for comparisons, errors can easily be committed: but not errors of principle like those which are committed in the valuing according to returns and which will be repeated by the commission of following the same principles, which the landowners do not understand the errors which may be made by the first method are such as are recognized by the landowners, and it therefore seems advisable to everywhere the valuation made by the owners themselves.

In taxing agricultural land, its market value were taken as a basis, a deal of inconvenience would arise: where for instance the industrial factor I has considerably increased the value of land, farming would no longer be able to pay the interest upon it, and under certain conditions would be together. In order to remedy this inconvenience, the factor I can be calculated and subtracted from the market value. The purely agricultural value would thus be obtained and this only should be conditionally

The exemption from taxes on the value I ought to be entered in the register, under the condition that the difference in the tax will be a compound interest by the land owner or his heirs when the land is to be built over or used for industrial purposes. In this way valuing according to market value would not increase the burthen of taxes on farms, but would be a bar to unwholesome speculation and a protection to agriculture and to public health in the neighbourhood of towns and industrial centres.

The writer expresses the wish that in the new valuations for taxation, the market value of an extensive purely agricultural district be ascertained as the present sum of taxes on returns for the same area. This latter should then be distributed according to the market value, so that the burthen would not change but be better distributed.

The agricultural improvements carried out by owners should not be taxed until the land changes hands. The sites of buildings and the gardens should pay land-tax and not house-tax.

The application of valuation according to this system requires a part of the State geologico-agricultural examinations of the soil on an extensive scale, as well as the determination and control of the valuation. This ought to be the duty of the valuation division of the land office which the writer desires to see established.

AGRICULTURAL INDUSTRIES.

298 - Variations in the Composition of Whole Milk used in Cheese Making.

KOSTLER, G. Schwankungen in der Zusammensetzung ganzer Käseereimilchen. *Schweizerische Milchzeitung*, Year 39, No. 9, p. 1. Schaffhausen, January 1913.

In dairies, where milk from various sources is used, adulteration of collected milk may occur, and is very difficult to prove scientifically on account of the large quantities dealt with. If, for instance, 10 lbs. of cream are taken from 1000 lbs. of milk, the fat content is decreased about 0.2 per cent. The question is now whether a difference of 0.2 per cent. in the fat content of collected milk is a normal variation or not. To find an answer to this query the writer has investigated the composition of the milk used at two cheese dairies every day for fortnight. The results are given in the following table:

Milk A (1). Morning-milk				Milk B (2). Evening-milk			
January 1913	Fat %	Total solids %	Solids not fat %	January 1913	Fat %	Total solids %	Solids not fat %
4	3.70	12.87	9.17	5	3.79	13.00	9.21
6	3.69	12.91	9.22	7	3.86	13.01	9.21
8	3.62	12.78	9.16	9	3.79	12.88	9.14
10	3.74	12.79	9.05	11	3.78	12.90	9.13
12	3.88	13.04	9.16	13	3.82	12.99	9.22
14	3.79	12.98	9.19	15	3.79	12.83	9.10
16	3.74	12.79	9.05	17	3.77	12.85	9.14

(1) From 11 farmers with 150 cows.

(2) From 28 farmers with 200 cows.

specific gravity at 15° C. varies from 1.0319 to 1.0329.
conclusions. — A difference of 0.2 per cent. in the fat content of
 of 200 gallons of mixed milk is suspicious; variations less than,
 considering the taking of the samples, cannot be taken to show that
 cream has been removed.

the Preservation of Milk Samples for Analysis.

CHÉDÉ, G. La conservation des échantillons de lait destinés à l'analyse. — *Annales des
 Epiphytoses*, Year 5, No. 50, pp. 559-561. Paris, December 1912.

The most effective chemical for preserving milk is carbolic acid;
 if this is dissolved in 10 cc. of a 95 per cent. solution of alcohol,
 1 cc. of this mixture suffices to preserve 100 cc. of milk. The compo-
 sition of the milk can be tested in the usual manner as well after this
 time as before. Experiments on this subject were made by the writer
 Dubois with the following results:

Milk No. 1.

Fresh milk (April 20)		Same milk + carbolic acid (May 25)	
	gr. per litre		gr. per litre
Acidity	2.70		2.70
Milk sugar	47.49		47.45
Fat	30		30
Casein	32		32
Ash	6.3		6.80
Solids	120.5		120

Milk No. 2.

Fresh milk (May 17)		Same milk + carbolic acid (June 3)	
	gr. per litre		gr. per litre
Acidity	1.80		1.80
Milk sugar	46.85		46.80
Fat	38.12		38.10
Casein	32		32
Ash	6.80		6.80
Solids	126		126

Milk No. 3.

This milk was investigated fresh in 1900, then preserved with carbolic
 acid and analysed 10 years later. Its composition was as follows:

1920		1900	
	gr. per litre		gr. per litre
Acidity	1.85		1.80
Milk sugar (anhydride) . .	46.40		46.85
Fat	37.90		38.12
Casein	32		32
Ash	6.75		6.80
Solids	126.40		126

300 - A Biological Method of Testing the Quality of Milk,

PARASCHTSCHUK, S. Biologische Untersuchungsmethode für die Güte der Milch. — *wirtschaftliches Zentralblatt*, Year 42, Part 3, pp. 65-69. Hannover, February 1, 1919.

The species of lactic acid bacteria present in milk vary according to its quality. The time which is required to coagulate milk and the characteristics of the coagulum differ according to the species of bacteria present. The writer has made use of the different physiological behaviour of the lactic acid bacteria for determining the quality of milk, employing the following species: Danish *Streptococcus*, Jaroslav *Diplococcus*, *Bact. Güntheri*, Russian *Streptococcus* and *Bac. bulgaricus*.

The investigations were carried out in the following manner: the milk was first sterilized and then inoculated with 1 to 2 per cent. liquid cult (in which each species was equally represented) and placed in a thermostat at a temperature of 32° to 36° C.

The time needed for coagulation was registered and the bacteria present were examined and were as follows:

Milk	Coagulation time	Quality of coagulum	Preponderant species of bacteria
Very good	5-6 hours	fine and of good flavour	Danish <i>Streptococcus</i> , Jaroslav <i>Diplococcus</i> , <i>Bact. Güntheri</i> .
Good-average. . .	5-7 hours	thinner, flavour good	Jaroslav <i>Diplococcus</i> , <i>Bact. Güntheri</i> , Russian <i>Streptococcus</i> .
Bad.	More than 8 hours	tenacious	Russian <i>Streptococcus</i> , <i>Bulgaricus</i> .

301 - Whey Lemonade.

BURRI, R. Die Molkenlimonade. — *Molkerei-Zeitung*, Year 27, No. 5, pp. 81-82. Berlin, January 17, 1913.

The latest product of the milk industry is "whey lemonade" made from Sterilized Basle from cheese-factory whey, which is poor in protein. (Application for patent is announced). This liquid, which is perfectly clear and stable for several weeks, is of a greenish colour, but this is lost if the bottles kept exposed to the light. The gas consists of small vesicles, as is the case with ordinary lemonade, and the taste slightly resembles that of milk which has been a little overheated (boiled taste).

The chemical composition of the beverage varies according to the whey (acid or rennet whey) and the method of cheese manufacture. In addition to the milk constituents (milk salts, sugar and acids), cane sugar is also present, as well as the carbonic acid introduced by pressure. Samples examined by Dr. Köstler-Rütti and the writer show the following proportions:

1. Acidity after removal of the carbonic acid	18.2	—	28.6	%
2. Nitrogen as protein			0.2	%
3. Cane sugar	5.8	—	5.9	%
4. Milk sugar	1.37	—	3.29	%
5. Ash	0.47	—	0.64	%
a) Lime, CaO	10.5	—	23.79	%
b) Phosphoric acid P_2O_5	15.52	—	18.8	%

The nutritive value of whey lemonade is higher than that of essence made; it also renders unnecessary the use of expensive sour milk preparations (yoghurt) in combatting inflammation of the intestines. When prized, this lemonade is germ-free and is especially suitable for milk

When whey is cheap and lemonade dear, the manufacture of whey alone promises to be a lucrative subordinate industry, especially in case of city dairies where cheese is made.

The Determination of the Water Content in Cheese.

ROHMANN, ELSE. Zur Bestimmung des Wassergehaltes im Käse. Mitteilung aus dem chemischen Untersuchungsamt der Stadt Breslau. — *Molkerei-Zeitung*, Year 27, No. 2, 1-2, Hildesheim, January 8, 1913.

Hitherto the amount of water in cheese has been determined either by drying the latter over sand, or by direct desiccation in a platinum vessel. If the two methods give the same results, the writer gives the latter the preference on account of its greater simplicity.

Another process was recommended by L. Mai and E. Rheinberger on the occasion of the chief meeting of the Union of German Food-Analysts. This was based on the principle of estimating the water by distillation with petroleum boiling at above 100°C ., which does not mix with the water and thus enables the direct estimation of the amount of the latter distilled. Petroleum is recommended as the most suitable distillation substance.

The writer has tried this new method on 20 different samples of cheese and compared it with the desiccating process in the platinum dish. She made triplicate estimations in both cases. The apparatus used in the distillation was that designed by L. Mai and supplied by Lautenschläger of Chemnitz.

Results. — The estimation of the water by distillation was carried out in triplicate, and the determinations were on the average closely concordant.

There were, however, some isolated cases where great differences were observed, as 0.52 per cent. in the case of a Swiss cheese and 0.57 per cent. for a Harz cheese. This may, however, be due to the difficulty in obtaining a homogeneous average sample of Harz cheese, as well as to the different methods employed in making many cheeses. A comparison of the results obtained by both methods showed that somewhat higher figures were obtained by distillation. Further tests were made with the idea that water might also be present in the petroleum, but there was no difference in the results. In a third of the samples tested, the difference between the two methods was less than 0.5 per cent., that is below the limit of

error allowed in duplicate determinations, and in the case of nine samples the difference was less than 1 per cent. The highest deviation was by Swiss cheese, being 1.87 per cent. It was particularly stored kinds of cheese which showed the differences with the different methods. This is possibly due to the formation, during keeping and ripening, of volatile substances capable of distillation at high temperatures. It also be that this cheese, on account of its stiff consistency, does not with all its water when dried in the oven.

Summary. — The distillation method deserves preference from a less time. It is also easy to carry out and saves weighing. As, however, not inconsiderable differences may arise from the use of the two methods it is necessary, in order to obtain uniform results at all experimental conditions, that one or other should be officially adopted.

303 — A Contribution to the Question of the Physiological Occurrence of Bacteria in Sound Meat.

GRUNT, OTTOKAR. Beitrag zur Frage des physiologischen Vorkommens von Bakterien im Fleische gesunder Schlachtrinder. — *Zeitschrift für Fleisch- und Milchwissenschaft*, XXIII, Part 9, pp. 193-207. Berlin, February 1, 1913.

The writer reviews the investigations of other experimenters regarding the germ content of meat and then describes his own work on this subject, which he undertook for the purpose of finding further proof for the bacteriological inspection of meat in slaughterhouses. He found amongst other things that bacteria placed on the outside of the meat quickly penetrated into it. This he attributes to the mechanical effect of the meat (pressure), which either directly causes the entrance of the bacteria, or brings it about indirectly by the expression of the meat-juice, which, on the cessation of pressure, is drawn into the meat again, taking the bacteria with it.

The results of the work are as follows :

1. In the flesh of sound slaughtered animals no bacteria occur physiologically.
2. As in practice outside infection of the meat is unavoidable, meat destined for consumption necessarily contains a certain number of germs.
3. To prove conclusively the presence of bacteria in meat, it is necessary to examine larger pieces (if possible enclosed in connective tissue) and to allow of the development of any microorganisms present, which necessitates the use of incubators.
4. The postmortem entrance of bacteria into the interior of the meat follows, especially after any mechanical injury, so quickly that such sterilization is generally too late.
5. In contradistinction to the flesh, the lymphatic vessels of sound cattle often contain bacteria.

The Pork Trade in the Argentine.

RELEY, JUAN B. Decadencia de la industria de preparados porcinos. — *Revista de Asociación rural del Uruguay*, Year XLI, No. 11, pp. 806-810. Montevideo, November, 1912.

In the Argentine Republic about 10 million acres of land are annually sown to maize and their production is upwards of 8 million tons; this portion of its great production of wheat, oats, and linseed might be devoted to the raising and fattening of live stock, and altogether the conditions for pig breeding and the pork industry seem very favourable. Nevertheless, the former is carried on to a very limited extent and several attempts made to establish the latter have failed.

The writer examines the causes of these failures and suggests remedies among which he places the better utilization of the offals.

Since 1900 the importation into the Argentine of prepared pork has constantly increased, whilst the exportation has diminished, and in 1911 was almost nil. The figures in the annexed table are taken from official statistics.

The value of the imports of pig products reached £140 331 in 1911, compared with £104 093 in 1910.

	Quantities		Values	
	1911	Difference compared with 1910	1911	Difference compared with 1910
	lbs.	lbs.	£ s	£ s
Importation:				
Pork	2 141	+	24 10	+ 172 11
Pork	415 441	+	18 687 3	+ 4 034 9
Salts	697 778	+	44 362 16	+ 743 1
Other	1 671 598	+	75 191 8	+ 15 385 2
Other	20 027	+	720 15	+ 182 16
Other	74 388	+	1 338 11	+ 398 13
Exportation:				
Pork	—	—	17 17	+ 11 18
Red pork	2 227	—	—	— 29 19
Other	—	—	—	— 1 478 0
Other	17 877	—	321 17	— 319 10
Other	69 714	+	250 18	+ 211 5

305 - Wool from Cyprus.

Bulletin of the Imperial Institute, Vol. X, No. 4, pp. 537-539. London, December 1912.

Sheep-raising is an important industry in Cyprus, large numbers of sheep being killed annually for local consumption; the wool produced is exported chiefly to France and Italy. The exports of wool were valued at £11 216, in 1909, and 6596 cwt., valued at £15 203, in 1910 (No further statistics are available). The total number of sheep in Cyprus in 1910 was about 400 000 (1). The wool is of inferior quality partly due to the breed and partly to the conditions under which the sheep are kept. Attempts have been made by the Agricultural Department to impress on the native breeders the necessity of keeping the sheep well fed, and experiments have been carried out at the Athalassa Experimental Farm for the purpose of demonstrating the advantages of careful rearing. In the annexed chart are enumerated the results of the examination — at the Imperial Institute of London — of the shoulder wool of two fleeces — a yearling ram (No. 1) and a yearling ewe (No. 2) — received from the Athalassa Farm. The examination stated that the fleeces represented an excellent class of carpet wool valued No. 1 at 9d. per lb. and No. 2 at 8d. to 8½d. per lb. in May 1912).

Chemical characters			Physical characters	
	No. 1 %	No. 2 %		No. 1 —
Moisture	10.9	10.3	Average tensile strength gr.	36
			Average elongation before breaking . . . %	36.8
Grease	1.0	1.8	Length of fibres * . . in.	1.18
Matter soluble in water . . .	2.1	3.3		
Matter insoluble in water	1.2	3.2	Diameter fibres . . in.	0.0019-0.0040 0.0026
Pure wool fibre	84.4	81.1	Average diameter . . .	0.0024

* These figures represent the range of length in the fibres over the whole fleece.

306 - The International Commission for Uniform Methods of Sugar Analysis in the Meeting held at New York on September 10, 1912.

WIECHMANN, F. G. in *The International Sugar Journal*, Vol. XV, No. 69, pp. 79-114. London, January 1913.

In the meeting held at New York on September 10, 1912 the International Commission for Uniform Methods of Sugar Analysis again expressed its opinion that "the official polarizations of raw sugar shall be made exclusively at the normal temperature of 20° C., the presence of invert sugar and other impurities precluding the use of formulae tables which have been elaborated for correcting the polarization of pure sucrose for changes of temperature."

(1) In 1909, 301 699 sheep and 277 357 goats. — *The Statesman's Yearbook for 1910*, p. 115. London.

the wish was expressed that "the various countries may prescribe a uniform temperature for the density determinations of sugar solutions." In trade analyses the use of temperature correction tables should be dispensed with, as far as possible."

The following resolutions were also adopted:

The normal temperature of $+20^{\circ}\text{C.}$ is to be retained for trade analyses.

In density determinations of aqueous sugar solutions, the density determined at normal temperature shall be referred to the density of water at 20°C. and to vacuo."

In density determinations made by weighing, the results must be reduced to 20°C. and to vacuo. To effect this it will be desirable that tables be prepared for this purpose."

Saillard, the French delegate, agreed to the latter part of the resolution provided that in France the normal temperature there customarily 15°C. , be retained in place of 20°C.

Wherever white light is used in polarimetric determinations, the light must be filtered through a solution of potassium dichromate of such concentration that the percentage content of the solution multiplied by the length of the column of the solution in centimetres is equal to

100, inasmuch as recent investigations tend to question the validity of the present 100° point of saccharimeters, and inasmuch as it is desirable that the Commission recognize and fix a transformation factor from Ventzke degrees, the President is hereby empowered to appoint a committee of three to fully investigate this question and report at the next official meeting."

Bacteria in Grape and Fruit Wines and the Alterations due to them.

DR. THURGAU and OSTERWALDEN. A. Die Bakterien im Wein und Obstwein und die durch sie verursachten Veränderungen. — *Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten*, Vol. 36, No. 6-14, pp. 129-338. Jena, December 28, 1912.

The writers give in Chapter I of their very exhaustive work a short history of the bacteria occurring in wine; after which follows a description of the diseases and alterations of wine which are caused by bac-

teria. Chapter II the methods followed by the writers in cultivating bacteria are described. As solid culture medium gelatine agar was used and as culture liquids several kinds of pear juices and grape juice. During the last ten years mostly extract of yeast (made by pressing yeast to 1 litre of water) with the addition of 1 per cent. of malic or tartaric acid and 2 to 3 per cent. of sugar, levulose or dextrose were added.

Chapter III contains an accurate description (Morphology, Physiological characteristics) of the pure cultures of bacteria grown by the writers. Of them belong to the lactic acid bacteria; they are divided

into four kinds: a) *Bacterium mannitopeum* (several strains); b) *Bacterium gracile* (several strains); c) *Micrococcus acidovorax*; d) *Micrococcus variococcus*.

Bacterium mannitopeum Müller-Thurgau, is found in great numbers in fruit and grape wines containing lactic acid. It forms short rods, shorter or longer septate and non-septate threads. The short rods are rounded at the extremities, 1.5 μ in length and varying in diameter between 0.7 and 1.3 μ , rarely outside these limits. The single rods do not show any spontaneous movements and do not form spores. In fruit juices and wines the bacteria often form large tufts composed of very much tangled threads. In wines of a certain composition, gloeæ are often formed; they are spherical bodies in which the single bacteria are often no longer easily to be distinguished, being firmly attached to each other by means of an intervening substance. These gloeæ may become bladder-like aggregates of bacteria. These bacteria do not liquefy gelatine. Colonies deep in the gelatine are of round, spindle shape, smooth; superficial colonies are roundish, with very ragged margins. Gram positive. Facultatively anaerobic. They cause energetic fermentation of levulose, dextrose and galactose, with production of malic, acetic and carbonic acids, as well as mannite from the first substance and ethyl alcohol from the other two. They further ferment saccharose, maltose, raffinose, *l*-arabinose, xylose, α -glucoside and amygdalin, but not of lactose, rhamnose, phloridzin, inulin, dextrin and peptone. They destroy malic acid, but slowly, in small quantities; fairly energetically acid ammonium and tartaric acid and its salts, succinic acid and lactic acid. Optimum temperature: between 26 and 34° C. They form strains which differ from each other in the diameters of the bacteria and in the energy of the lactic acid fermentation.

Bacterium gracile Müller-Thurgau is found in grape and fruit wines containing lactic acid, as well as in those which have suffered a reduction of their acid content. These bacteria form short rods, and are shorter, often strongly bent, septate threads. The rods are 1 μ in length and their fairly constant diameter is 0.5 μ . No spores and no spontaneous motion. They seldom form tufts and the small ones, that is small tangles of threads; they also form zoogloeal bladder-like aggregates. They do not liquefy gelatine. Colonies deep in the gelatine are spherical and smooth. Superficial colonies have irregular margins. Gram positive. Facultatively anaerobic. They cause fermentation of levulose, dextrose and galactose, with production of malic, acetic and carbonic acids, forming mannite from levulose and ethyl alcohol from the other two bodies. They do not induce fermentation in saccharose, lactose, maltose, raffinose, *l*-arabinose, xylose, α -glucoside, mannite, dextrin or Witte's peptone, but do so in α -glucoside and to a certain extent in amygdalin. They decompose energetically malic and citric acids and calcium malate; with less energy neutral potassium malate and ammonium malate. Tartaric acid

are not attacked, nor are succinic and lactic acids. Optimum temperatures between 22 and 26° C. They form strains which differ in the dimensions of the rods than in the energy of the fermentation.

rococcus acidovorax n. sp. is found in wines in which destruction is taking place, also mixed with other causes of infection in diseases. It forms single cocci, diplococci and tetrads (merismoggregates). Single cocci 0.5 to 0.7 μ diameter. They form chains and bladder-like groups in wines of certain compositions. They show no spontaneous movement and form no spores. They do not liquefy gelatine. Colonies deep in gelatine are of spherical shape and entire. Superficial colonies are rounded and their edges entire. Gram positive. Facultatively anaerobic. They produce only lactic acid and decompose dextrose, levulose, galactose, lactose and maltose, producing lactic acid without by-products such as acetic and carbonic acids. They do not cause fermentation of saccharose, raffinose, *l*-arabinose, rhamnose, α -methylglucoside, amygdalin, phloridzin, mannite, or Witte's peptone. They decompose malic acid energetically, producing lactic and carbonic acids, and also decompose neutral calcium malate and neutral ammonium malate. They do not cause the fermentation of tartaric acid and its salts nor of citric, succinic, and lactic acids. Optimum temperature: 26.5° C.

rococcus variococcus n. sp. is found, for instance, in red and white wines in which destruction of the acid content is going on ("siedende Fäule"). They form cocci, diplococci and tetrads (merismopedian aggregates). The diameter of the single cocci varies considerably, from 0.6 to 1.0 μ . In wines of certain composition they form zoogloæ. They show no spontaneous movement and do not form spores. They do not liquefy gelatine. Deep colonies in gelatine are spherical and smooth; superficial colonies have entire margins. Gram positive. Facultatively anaerobic. They produce only lactic acid, but with less energy than *rococcus acidovorax*; they decompose levulose, dextrose and galactose, forming lactic acid and without by-products such as acetic and carbonic acids. They do not cause fermentation of saccharose, lactulose, raffinose, *l*-arabinose, xylose, rhamnose, phloridzin, mannite, or Witte's peptone, but do so in the case of α -methylglucosid and partly in the case of amygdalin, producing with the latter oil of bitter almond. They cause active fermentation of malic acid, neutral potassium ammonium malates and acid calcium malate, but not of tartaric acid and its salts, nor of citric, succinic and lactic acids. Optimum temperature: 26.5° C. They form strains which differ in the energy of their active properties.

Considering the unsettled state which still prevails in the systematic classification of bacteria, it is difficult to class correctly the above-described species.

Chapter IV the alterations in wine are discussed in the light of the results obtained with cultures of bacteria.

a) The simple destruction of acidity by the agency of heat without the production of volatile acids or other unfavourable by-products is not to be considered as a disease of wines, since it increases the value of wines very rich in acids. It is just on this kind of destruction of acidity that very few data are found in the works of French investigators; they speak of "*tourne*" and "*pousse*" and mean by these terms a modification of wines. While according to the writers "*pousse*" implies several alterations of wine caused by bacteria and accompanied by the formation of carbonic acid. This "*pousse*" can appear together with the simple destruction of acidity, with the formation of lactic acid and "*tourne*." Under "*tourne*" the writers understand only the consequence of the destruction of acidity in wines that are poor in acids.

The destruction of acidity is not caused by ferments but by bacteria, namely *Bacterium gracile* or species of *Micrococcus* (*Micrococcus varians* Seifert, *M. acidovorax* and *M. variococcus*). Cool cellaring, racking from the lees, the addition of potassium metasulphite to the wine or the fumes of burning sulphur delay the destruction of acidity. It can also be prevented by the addition of acids. Malic acid as an acid is too expensive; besides, some bacteria destroy this acid also, as is citric acid. As the most suitable the writers recommend tartaric acid. Tanning also reduces the destruction of acidity. Fining cannot be considered as an efficient remedy, as it does not rid the wine of the bacteria which cause the mischief.

Where a diminution of acidity is desirable, it can be favoured by the omission of some of the above-mentioned preventive processes. Where the reduction of acidity may be promoted by the addition of chemicals, of bacteria must be ascertained by further experiments.

b) Acidity due to lactic acid occurs in fruit wines that are rich in acidity and in mild grape wines; it is detected by a sour sweetish, what acid taste and an odour recalling sauerkraut. The principal cause of sourness due to lactic acid is the decomposition of sugar, accompanied by the production of lactic acid and much volatile acid. With this as a rule, the destruction of malic acid and frequently a mannitic fermentation are connected, though the quantity of mannite that is formed depends essentially upon the temperature and upon the extent to which alcoholic fermentation had proceeded when the disease made its appearance. In French literature no special term is found for the sourness due to lactic acid, it being considered by French investigators together with mannitic fermentation and "*tourne*." The writers consider the sourness due to lactic acid and mannitic fermentation as two distinct diseases, with the reserve that with the latter the former is always connected, while with the former lactic acid sourness can appear alone. In the writers' experiments, *Bacterium manniopoeum* was almost always the cause of lactic acid sourness; exceptionally could it be attributed to *Bacterium gracile*. A high content of acidity or of tannin or a moderate amount of both together can prevent lactic acid sourness. Very low temperature during fermentation can also act as a preventive, though with low acid and tannin con-

slight degree of warmth is sufficient to originate lactic acid sourness. Lack of the lees is a preventive of the disease when it is accompanied with an average acid and tannin content and moderate temperature. It behaves similarly with the use of sulphurous acid. The employment of pure ferments is also a protection to a certain extent against lactic acid sourness.

The "mousiness" (smell and taste of acetamide) according to experts by the writers, appears to be due to *Bacterium mannitopeum*. These bacteria multiply chiefly in liquids containing sugar; consequently they appear in refermented wines to which sugar solutions have been

The turning ("tourne") of wines has already been mentioned above. Experts abstain from giving a definition of this disease, as their investigation of it are not yet sufficiently advanced. They do not affirm that it is always a consequence of the destruction of acidity, but they confirm the results of their investigations on diseased wines that the two phenomena are intimately connected.

In Chapter V the writers give advice on the analyses of wines, and not only the determination of the amount of lactic acid but also the determination of its origin by means of bacteriological examination. It is stated that all the bacteria that the writers describe are producers of lactic acid, but their power of producing this acid is various. Wines containing only small quantities of lactic acid and of volatile acids are generally sound.

Wines containing much lactic acid and little volatile acids a destruction of acidity has, as a rule, taken place. Examination under the microscope reveals what kind of bacteria have taken part in the process; frequently *Bacterium gracile* will be found to have been the cause, but *occasionally* can also be found. Wines contain but little lactic acid and much acidity when, owing to improper handling, they have contracted lactic acid sourness. As mould ferments also produce volatile acids they also must be taken into consideration. In both cases investigation under the microscope throws light on the origin of the volatile acids. If more than 2 to 3 per thousand of lactic acid is found, it is to be assumed that this is due to the destroying bacteria or to the transformation of sugar caused by

the presence of much lactic acid and much volatile acid (2 to 3 per thousand) appear in lactic acid sourness. As causes, *Bacterium mannitopeum*, the mannite producer of Gayon and Dubourg, and exceptionally also *Bacterium gracile* are considered. The first two are easily revealed by the microscope. If *Bacterium gracile* is the cause, the presence of mannite in the wine can be proved by microscopical investigation. If *Bacterium gracile* has only produced acidity and formed lactic acid, while acetic acid bacteria have produced acetic acid, no mannite will be found.

When much lactic acid and much acetic acid are present and the latter is in the majority, most frequently it is a case of lactic acid sourness connected with acetic acid sourness.

308 - The Acidification of Musts by the Action of Yeast during Alcoholic Fermentation.

FERNBACH, A. L'acidification des moûts par la levure au cours de la fermentation alcoolique. — *Revue de Viticulture*, Year 20, Vol. XXXIX, No. 997, pp. 113-114. Paris, May 23, 1913.

All liquids containing sugar, when submitted to alcoholic fermentation, undergo during the process an increase in acidity due, in a measure, to the production of succinic acid, but chiefly to the formation of volatile acids (acetic acid predominates always, and sometimes is the only volatile acid formed). Numerous different species of yeast are clearly distinguishable by the nature and the proportion of the volatile acids they produce in a given medium.

The experiments of which the results are given later, were undertaken for the purpose of ascertaining how the acidification of the fermenting liquid varies in the use of the same yeast, according to different influences, and particularly in order to discover if this variation is due to the influence of the reaction of the medium.

To this end, the writer sowed a number of cells of the same yeast in a series of flasks containing the same sugary liquid, artificial or natural (grape must), adding increasing amounts of tartaric acid varying from 0 to 8 gr. per litre. In the different flasks of the series, he determined at the same time whether the fermentation had been completed or not, the acidity of the liquid, the amount of sugar remaining, the alcohol produced and the weight of yeast formed. The following are the figures obtained in the course of some of the writer's experiments giving the increase in acidity expressed everywhere, as is the case, in mg. of total tartaric acid:

A. Beer Yeast Br.

Original acidity	0	25	50	100
Increase in acidity { Expt. a	59.5	45.4	41	33
{ Expt. b	59.8	50	50	50

B. Wine Yeast.

Original acidity	0	25	50	100	200
Increase in acidity { Yeast C.	66.5	52	48	22.5	—
{ Yeast L.	123.5	107	100	91	61.5

It is seen that, in all these cases, the less acid the liquid was at the start, the greater the subsequent increase in acidity. Thus the various yeasts are affected in the acidification which they produce, by the influence of the medium in which they act, quite independently of their own individual characteristics.

This conclusion is of great importance from the practical standpoint. Acidification has of late been rightly regarded as a means of increasing the stability of fermented beverages, and it has been strongly recommended that those yeasts which give rise to the highest degree of acidity should be used.

ted. It is evident that the influence exerted upon this acidification by the original acidity of the must should be taken into account. The above mentioned facts show that this matter is no less important, especially, for the study of the mechanism of alcoholic fermentation. They furnish a practical means of increasing acid production by and the writer hopes to show shortly how this method can be employed in the study of the intermediate products of fermentation.

Analytical Characters of the 1912 Musts in the Canton of Vaud, Switzerland.

REY, F. and TONDUZ, P. *Mûts vaudois 1912.* — *Procès-Verbaux de la Société Vaudoise des sciences naturelles*, No. 2, 1913 (meeting of January 8). Lausanne, January 1913.

This article gives a summary of the analytical statistics of the musts of Vaud in 1912 (1). The analyses dealt with 137 samples. The weather, which on October 16 encouraged optimism, was unfavorable of very short duration, for on the 21st rain fell once more. This brief period produced a decrease in quantity and quality — a rare occurrence — causing the ripe grapes to rot, while the less ripe ones remained unharmed.

In spite of this, the predictions were realized in so far that the sugar of the 1912 musts was, on the average, very similar to that of 1911. The following table shows the difference in this respect between the musts of 1912 and the wines of 1911.

District of Aigle-Yverne-Villeneuve.

	29 samples of 1912 musts.	29 samples of 1911 wines.
	Sugar %	Alcohol %
	—	—
Maximum	23.3	12.1
Minimum	15.0	9.4
Average	19.1	10.6

District of la Côte.

	43 samples of 1912 musts.	41 samples of 1911 wines.
Maximum	20.1	11.7
Minimum	12.7	9.6
Average	16.5	10.5

District of Lavaux.

	31 samples of 1912 musts.	25 samples of 1911 wines.
Maximum	20.3	12.5
Minimum	13.8	9.8
Average	17.4	11.1

¹ The 1911 musts and wines of Vaud, see No. 713, B. April 1912.

District of Morges.

	14 samples of 1912 musts.	12 samples of 1911 wines.
Maximum	16.9	10.5
Minimum	13.6	8.0
Average	15.3	9.0

District of Vevey-Montreux.

	15 samples of 1912 musts.	31 samples of 1911 wines.
Maximum	19.6	11.5
Minimum	15.4	9.0
Average	17.5	10.3

As is shown by these figures, the average alcohol content of the wines in two of the districts is superior to that of the wines of 1911, in the three other districts it is inferior; the differences vary by +0.5 per cent. and -0.9 per cent.

Acid content. — The season of 1911 produced wines in the G. of Vaud which were abnormally deficient in acids, while those of had a very high acid content. The figures have not yet been generally recorded, but the statement refers not only to the Swiss vineyards also to those of the rest of Europe, with the exception of the southern parts of Italy and of Spain.

The acidity of the musts from Vaud which were analysed varied from 9.8 gr. to 16.4 gr. per litre; in the greater number of the samples it was between 11 and 13 gr. per litre. It is an interesting side fact, which has been recorded fairly regularly, that when the grapes ripens with difficulty, the acidity is due essentially to malic acid and to tartaric acid or acid salts.

Usually the malic acid in wines is split up by the action of a micro-organism into lactic acid and carbonic acid. This causes a decrease in the acidity independently of the settling of the tartrates. At the end of January 1913, this malo-lactic decrease was not yet perceptible in the Champ-de-l'Air wine, though it contains 6.3 gr. of malic acid and a total acid content of 13.6 gr. per litre.

310 - New Materials for Paper-Making.

1. — New Sources of Paper (*Hedygium coronarium* Koen and Allies). — *Royal Botanic Gardens, Kew: Bulletin of Miscellaneous Information*, No. 9, pp. 373-378, 1912.
2. — Marram Grass for Paper-making. — *Ibid.*, p. 396.
3. — Experiments with New Materials for the Manufacture of Paper. — *Bulletin Imperial Institute*, Vol. X, No. 3, pp. 372-380, London, 1912.

1. — *Hedygium coronarium* (Zingiberaceæ) is a native of India, being distributed from the Himalayas to Ceylon and Malacca; it is also recorded from Central America, the West Indies, Mauritius and Africa (Corisco Bay). In some of the States of Brazil it has been found being especially abundant at Morrettes in the State of Parana, where it has covered a large tract of swampy country. In Brazil, the plant

and completely covers the land. The stems are said to reach a height of 1 to 1½ metres (3 to 5 ft.) and to be about 2-4 cm. in thickness; the margins of streams, however, the stems grow as high as 2 metres (6 ft. in.). After cutting down the stems, some 4 to 5 months must elapse before they grow again.

Paper has been made both from the dried material received from Brazil and from fresh stems supplied from Kew. The paper in both cases is said to be identical, and the plant seems likely to be a valuable source of material for the paper-maker. The fibre has great tensile strength, the "breaking length" being from 9 000 to 10 000 metres. The elasticity and folding qualities of the paper are exceptional. It can be made to bear ink and possesses parchment qualities without any special treatment. These properties are due to the presence of cells of a gelatinous nature, which are associated with the fibre; the amount of these cells in the unbleached paper is 17.3 per cent. Cellulose in stems of air-dried 41 per cent.; length of fibre in unbleached *Hedychium* 1 mm.

The writer gives a description of paper-making and of the physical properties of the fibre. He concludes by saying that owing to the remarkable qualities of *Hedychium* it seems likely to be in considerable demand in the near future.

The stems of *Amomum hemisphericum* and *Alpinia nutans* (Zingiberaceæ) were also examined as to their paper-making qualities. The former is a native of Java; the latter is recorded from Hong Kong, Formosa, Cochin China, the Eastern Himalaya and the Malay Peninsula; it is also known from the West Indies, Guatemala, Venezuela, Surinam and Brazil. The stems of *Amomum* reach a height of 5 metres (over 16 ft.); those of *Alpinia* are stated to be 2.5 to 3 m. (8 to 10 ft.) high. The latter plant would probably form dense thickets in swampy country. The yield of unbleached paper: from green stem, *Amomum* 7.44 per cent., *Alpinia* 5.93 per cent., and from the dry stem respectively 58.2 per cent. Both plants are suitable for making white and brown paper, but they are considerably inferior to *Hedychium*, being devoid of the self-sizing property of the latter.

2.—Marram grass (*Ammophila arenaria* Link.). This plant grows on the sandhills on the coast of Great Britain and acts as a very effective sand-binder. Experiments in paper-making have been made with marram grass, which possesses quite useful qualities in this direction. The yield of unbleached paper from the green stem was 17.7 per cent., and from the dry stem 31.4 per cent. The average length of unbeaten fibres contained in the pulp was 0.65 mm.

3.—The following table gives a summary of the results of the examination of new materials for the manufacture of paper undertaken at the Royal Institute (London).

Material examined	Moisture on drying at 100-110°C	Ash in dried material	Yield of pulp (dried at 100-110°C)			
			Non-bleached		Bleached	Loss in weight in pulp on bleaching
			Per- centage of dried material	Per- centage of material as received		
Papyrus (stems) from E. Africa	13.6	8.6	31.4	26.3	30.7 ⁽¹⁾	2.3
Papyrus (stems) from the Sudan	13.8	6.9	34.2	29.4	33.1 ⁽¹⁾	2.9
<i>Arundo Donax</i> from the Trans- vaal	13.4	2.7	27.6	23.9	—	4.8
<i>Aristida</i> sp. Transvaal. . . .	9.0	2.7	28.2	25.6	25.1 ⁽¹⁾	2.3
"Nipa" (petiole and fibre) from the Malay States . . .	21.5	14.2	13.8	10.8	12.6 ⁽¹⁾	8.4
<i>Borassus flabellifer</i> (leaves) from Mozambique	10.3	4.1	48 ⁽²⁾	43 ⁽²⁾	—	—
<i>Bromelia</i> (leaves) from Brazil.	14.3	7.2	21 (about)	18 (about)	—	—
Algerian Esparto.	8.8	3.0	32.3	29.5	32 ⁽¹⁾	1.3

(1) Percentage of dried material. — (2) Percentage of material as received. — (3) Cellulose.

All the fibrous materials enumerated are capable of conversion pulp suitable for the manufacture of paper, though in some cases not known whether they could be utilised to advantage on a commercial scale. The raw materials would probably not realize more than £ 3 per ton in the United Kingdom, and it is therefore very unlikely they could be profitably exported, especially in view of their bulk. For this reason, in conjunction with the fact that they have somewhat small yields of pulp, the best way to deal with these products would be either to convert the raw material into "half-stuff" and export the latter, or to employ it locally for the manufacture of paper.

PLANT DISEASES

GENERAL INFORMATION.

Report for Presentation to the Ghent Congress of 1913, Respecting the Plant Pathology Service, by the International Union of Professional Horticulturists.

1917, A. DE (Président de la Chambre syndicale des Horticulteurs Belges, Gand). Rapport sur le service phytopathologique de l'U. H. P. I. — *Union Horticole Professionnelle Internationale, U. H. P. I., Rapports pour le Congrès de Gand en 1913, présentés par le Président, H. Müller, Langsur*, pp. 17-19 (n. d.).

by means of circulars and its annual report for 1911, the "Chambre syndicale des Horticulteurs Belges" has published in detail the proceedings of the Horticultural Congress at Luxemburg. The above-mentioned has drawn the special attention of the Belgian Government to changes in the transport service suggested by the Berne International Congress and to the institution of a Service of Plant Pathology. The intention thus furnished has been given due consideration by the Belgian Government; the law for the establishment of a Service of Plant Pathology was passed (1) and, on the occasion of the next Railway Convention, the Government will as far as possible try to meet the wishes of the horticulturists.

Propaganda work in the same direction is in progress in France under the auspices of the "Fédération des Syndicats Horticoles de France." It insists upon the necessity of similar work being done in every country; for only in this manner will the International Union of Professional Horticulturists be able to carry on efficiently its international work. The "Chambre Syndicale des Horticulteurs Belges" has interested much in the creation of a Plant Sanitary Service, and has always endeavored to keep the plants and horticultural products of Belgium free from cryptogamic diseases and from injurious insects; providing its members with instructions and means of combating these pests. By promoting the attempts made in other countries, the Chamber has elaborated a scheme, which seems to embrace the prophylactic measures necessary for all lands. The Luxemburg Congress unanimously adopted the project put forward by the Belgian Syndical Chamber, and

See No. 66, B. Jan. 1913.

passed a vote expressing their wish that the Service of Plant Pathology should become general throughout Europe. The same Congress decided that all crops should be placed under the care of inspectors whose duties should also include imparting practical instruction to growers regarding methods of controlling plant diseases. Such a service, but placed on a broader basis, has been established by the law brought forward on 126, 1912, and approved by royal decree.

Phytopathological regulations were sanctioned in Holland by law of March 29, 1909. A Service of Inspection of Horticultural Products was established in France by the decree of May 1, 1911. Plant pathology inspection in Great Britain is governed by a series of regulations. The United States have special laws for every State of the Union.

The writer suggests that each of the syndicate Associations or International Union of Professional Horticulturists should be requested to furnish an account of the Service of Plant Pathology in its particular country (3). Once the text of the different laws was obtained, it would be possible to coordinate them, arrange them under a general heading, prefer to the different Governments an official request for the establishment of a Plant Sanitary Service, which should be alike in all the allied countries, and make obligatory that all horticultural products exported should be furnished with a certificate of immunity. This certificate should be drawn up according to one model, as in the case of the adopted by the International Phylloxera Convention of Berne (4).

312 - Decree concerning the Reorganisation of the Service of Phytopathological Inspection of Horticultural Produce in France. (5)

Décret portant réorganisation du Service d'inspection phytopathologique de la production horticole en France. — *Journal officiel de la République française*, Year 25, p. Paris, January 26, 1913.

The President of the French Republic issued the following decree under date of January 16, 1913:

Article 1. — The work of the Service of Phytopathological Inspection of Horticultural Products instituted by the Ministry of Agriculture by decree of May 1, 1911, has been modified and determined as follows:

Art. 2. — The Staff of the Service is nominated by order of the Ministry within the limits of the appropriation for this object in the Budget of the Ministry of Agriculture. It consists of: a) A chief inspector, the head of the Service, to whom is entrusted the direction and scientific control

(1) See No. 1676, B. Dec. 1912.

(2) See No. 182, B. Feb. 1913.

(3) See in this connection: *L'organisation actuelle du service de protection contre les maladies des plantes et les insectes nuisibles dans les divers pays.* — Rome, International Institute of Agriculture, 1911.

(4) See: CUBONI, G. The Basis of an International Agreement for the Control of Plant Diseases. B. Nov. 1912, pp. 2349-2354.

(5) See also No. 1604, B. May 1911; No. 3084, B. Aug.-Sept.-Oct. 1911.

the branches of the Service, the superintendence of the work of inspectors and assistant inspectors, the furnishing of necessary instructions to these officers to enable them to carry out all the investigations required by the present decree, and the supplying, when required, of the certificates of phytopathological inspection. *b*) An assistant to the chief inspector, whose duty it is to assist the principal inspector in his work. *c*) Temporary agents, with the title of inspector, entrusted with visiting the horticultural institutions committed to their care to see that the plantations are in good condition, that produce despatched thence harbours no insects known to be injurious, and no cryptogamic diseases capable of spreading, and if necessary, to provide certificates of phytopathological inspection. *d*) Temporary agents, bearing the title of sub-inspectors and entrusted with supplementing the inspectors of the Service in the branch which is specially entrusted to them.

Art. 3. — The officers of the Phytopathological Service are required to exercise, within the limits of the present decree and the Ministerial instructions, the supervision of those horticultural establishments and branch institutions entrusted to them. When on inspection tours, the inspectors are provided with the card proving their identity; this they receive from the Minister of Agriculture.

Art. 4. — The inspectors and sub-inspectors are proposed by the chief inspectors and nominated annually. Their number varies according to the requirements of the Service. The conditions for recruiting inspectors and sub-inspectors are settled by ministerial decree.

Art. 5. — The work of the chief inspector and his assistant is settled by the Minister of Agriculture. The State Scientific Institutions nominated by the Minister of Agriculture, who will also apportion to each individual his special task.

Art. 6. — The chief inspectors, inspectors and sub-inspectors nominated by the present decree receive in remuneration of their services and for travelling expenses a sum which is not subject to the deductions provided by the law of June 9, 1853, in the case of civil pensions and is calculated according to a basis fixed by the decree of the Minister of Agriculture.

Art. 7. — The expenses entailed in the phytopathological inspection of horticultural products are stated in a special clause in the budget of the Ministry of Agriculture. They are apportioned among the persons interested in the following manner: the first charge of the expenses is covered by a fixed annual tax of £1, levied upon each controlled horticultural establishment, and the surplus is divided in proportion to the market value of the products for which phytopathological certificates have been granted. The contribution to be contributed by each horticulturist is recovered by means of a tax levied and collected by the Minister of Agriculture, even in the case of total or partial refusal of certificates of phytopathological inspection. The sums are entered under the head of "Various contributions to the Service."

Art. 8. — Every horticulturist who wishes to submit his premises to phytopathological inspection must apply to the Minister of Agriculture on or before April 1 of each year, writing his request upon stamped paper accord-

ing to the prescribed form and pledging himself : a) To conform ab to the instructions of the Minister of Agriculture, or his represe in all matters concerning phytopathological inspection. b) To st declaration accompanying his request the precise situation of the tions to be inspected and the approximate area of each. c) Not to among plants which he sends away, any from unsupervised plan without furnishing to the inspector in his district entrusted with an phytopathological certificates the name and address of the nursery nishing the said plants ; the establishments of these nurserymen entered on the lists of phytopathological inspection. d) To send request for a certificate of pathological inspection a certified copy consular invoice accompanying the goods which tallies with his keeping entires and gives the detailed and total value of the plan e) To provide the officers of the service charged with visiting his es ments with all necessary assistance in the discharge of their duties. pay at the prescribed intervals the amount which falls to his shan expenses incurred in the organization of the Service of Phytopath Inspection, in accordance with the provisions of article 9 of the Dec. 16, 1910 and of article 2 of the present decree.

Art. 9. — The State assumes no responsibility for itself and its as regards the possible results, either to the horticulturists or to an party, of the organization or working of the Service of Phytopath Inspection provided by the present decree, or as to the acceptance fusal by foreigners of the certificates of phytopathological inspec

Art. 10. — As soon as the officials and agents of the Service are that the horticulturists have not fulfilled all their engagements, they at once inform the Minister of Agriculture, who will decide upon the sary measures to be taken.

Art. 11. — The Ministers of Agriculture and of Finance are ent in their several capacities, with the execution of the present decree.

313 - Royal Decree concerning the Introduction into Libya of W Agricultural, Forest and Ornamental Plants coming from the Kingdom of Italy.

Regio decreto riguardante l'introduzione in Libia delle piante legnose, agrarie, forestali e ornamentali provenienti dal Regno d'Italia. — *Gazzetta ufficiale del Regno d'Italia*, No. 32, p. 805. Roma, February 8, 1913.

His Majesty the King of Italy, considering the Law of July 6, No. 749 ; considering the Royal Decree of November 20, 1912, No. 1 on the proposal of the Minister of the Colonies in accord with the 1 ter of Agriculture, Industry and Commerce, has, on February 2, decreed as follows :

Art. 1. — The introduction into Libya of woody, agricultural, forestal and ornamental plants coming from the Kingdom of Italy is forth unless said plants be accompanied by a certificate of origin issued by municipal authorities and by a certificate guaranteeing their immut

such diseases as would endanger the produce of plants cultivated in the Colony.

Art. 2. — Such declaration will be issued by the Royal phytophylloxera delegate or by the technical delegate of the anti-phytophylloxera association, according to the single text of the Laws, June 6, 1909, No. 356, and July 7, 1909, No. 490, on the Associations for the defence against phytophylloxera, or by the Directors of Stations or of Laboratories of Plant Pathology or of Agricultural Entomology. Horticultural establishments, schools and gardens which are inscribed in the official list which is published every year by the Ministry of Agriculture are exempted from the obligation of presenting the certificates mentioned in the preceding article.

Art. 3. — As for vines, the introduction of rooted cuttings or rootstocks is absolutely forbidden. Only the importation of cuttings is permitted provided they be accompanied by the certificate mentioned in the preceding article.

Art. 4. — Plants coming from abroad are subject to the provisions laid down in the Antiphytophylloxera Convention signed at Berne on November 1881, besides which their immunity from diseases other than phytophylloxera is to be recognized by an expert before their introduction is allowed.

Art. 5. — Plants found infected by the diseases mentioned in Art. 1 are to be destroyed and the owner shall have no right to any indemnity. The Minister proposing this Law is charged with the execution of the preceding articles.

New Zealand Prohibition against Crown-gall

Agricultural Gazette of New South Wales, Vol. XXIII, Part 12, p. 1042. Sydney, December 1912.

The New Zealand Government has issued a proclamation prohibiting the introduction into the Dominion of any fruit or plants infected with any disease known as Root knot, Hairy root, or Crown-gall (*Bacterium carotae*). If any plant, fruit, etc., affected is introduced or attempted to be introduced, it and any wrappings, etc., will be re-shipped or destroyed at the expense of entry. Re-shipment, however, is conditional on the approval of the Customs Inspector, and, in the event of destruction, the fees for such destruction are payable by the person in charge of the consignment.

Rhodesian Restriction on Potatoes.

Union of South Africa Government Gazette, Vol. X, No. 290, p. 783. Pretoria, December 5, 1912.

The Southern Rhodesia Government Notice No. 319 of 1912, dated December 5, 1912, reads as follows:

Any consignment of potatoes imported from other parts of South Africa or from overseas, if found on inspection to be infested with the pest known as "root gall worm" (*Heterodera radicum*), will be refused admission to Southern Rhodesia or destroyed.

BACTERIAL AND FUNGOID DISEASES.

316 - Effect of the Time of Sowing upon the Susceptibility of
to Bunt (*Tilletia Tritici*). (1).

MUNERATI, O. Sulla recettività del frumento per la carie in rapporto al tempo di
— *Rendiconti delle sedute della Reale Accademia dei Lincei, Classe di Scienze fisiche, matematiche e naturali*, Vol. XXI, Part 12, pp. 875-878. Rome, 1912.

From experiments made by the writer in 1909 and 1910, it appears that the temperature at the moment of sowing and during the days of the first phases of the development of the young plant, has a decided influence upon the susceptibility of the wheat itself to the attacks of *Tilletia* (Bjerk.) Wint. In order to test this statement further, the writer made the experiments in 1910-1911 and in 1911-1912. In the first case winter wheat (Cologna) and a spring wheat (Marzuolo Veronese) were used and in 1911-1912 Gentil Rosso and Marzuolo Americano Rosso.

The results of the investigations and observations of these long series show that :

a) A seed which is severely infected with the resting spores of the parasite does not necessarily give rise to a plant which will be attacked by the parasite. The factor which in this case determines the susceptibility of the plant to the parasite, is the temperature at the time of sowing and during the early phases of development; the more rapidly the wheat grows, the better it escapes from the attack of the parasite, and viceversa. The seed can produce 0 per cent. of infected ears in the first case, as against 80 per cent. in the second.

b) No treatment of the seed will thus ensure immunity from the attacks of bunt. But in practice, it is wise to apply some treatment to the seeds in order to destroy any bunt spores which may chance to adhere to the integument of the wheat; this is the more urgent, when it is not possible, or necessary, to sow late in the autumn or very early in the spring.

c) The application of an adhesive substance (such as is effected by immersing the seeds in a solution of copper sulphate and spraying repeatedly with lime) does not ensure complete immunity from bunt in the case of every plant, as it may be attacked either by spores which afterwards adhere to the integument, or by those with which the germinating seed comes into contact in the soil; nevertheless a considerable number of spores are rendered innocuous by the prolonged fungicidal action of the copper compound.

The decided influence of the sowing time upon the susceptibility of wheat to bunt would explain why in past years, when the seed corn was not treated, seasons when the parasite was rife alternated with those when the crops were almost free from its attacks. The years when the parasite caused great havoc were those when the plants grew slowly during the first phases of development.

(1) See also No. 1679, B. Dec. 1912.

observations made also suggest that when it is wished to determine the efficacy of a fungicide or special method of *Tilletia* control, it is best to sow the treated seed either late in the autumn (in the case of winter kinds) or very early in the spring (for spring kinds), in order that the plants may be as susceptible as possible to the attacks of the parasite.

Lime-Sulphur Washes in the Control of Fumagine and Olive Scale (1).

BERESI, G. A. La poltiglia solfo-calcaica nella lotta contro la fumaggine e la cocciniglia dell'olivo. — *Il Coltivatore*, Year 59, No. 1, pp. 19-20. Casale Monferrato, January, 1913.

In 1912, control experiments of fumagine and the olive scale were made in the oliveyards of (Abruzzi) with lime-sulphur washes (formula of the Royal Experiment Station for the Cultivation of Citrus and Fruit Trees at Acireale, (2),

four applications were made: the first was carried out in three distinct plots of the oliveyards, which served as an experimental plot and 8, 6 and 4. The solutions were respectively used; in the subsequent spraying, solutions weaker than two per cent. were sprayed on all the trees. These operations were repeated on each reappearance of the scales. The olive scales have almost entirely disappeared from the experimental plots; the fumagine attack was so far advanced that there was no possibility of curing the disease, although the wash had the effect of slightly checking development.

A 1 per cent. solution of this wash was also applied to some trees which had been grafted three years previously and planted in the spring; no ill effect or other bad effect was noticeable, even on the young buds, which were very plentiful.

These experiments will be repeated, on a larger scale, during 1913.

The Diseases of the White Lupin in the State of Sao Paulo (Brazil).

DAR, GREGORIO. Tremoco branco e suas molestias. — *Secretaria da Agricultura, Commercio e Obras Publicas do Estado de Sao Paulo, Boletim de Agricultura*, Series 13, No. 5, pp. 427-432, 2 figs. São Paulo, 1912.

Amongst the plants cultivated in the State of São Paulo, Brazil, the white lupin (*Lupinus albus*, "Tremoco branco") occupies an important place, especially as a green manure for coffee, vines, etc.; further it is a plant which grows very well and does not fear drought.

At the estate of the Agricultural Institute of Campinas, this plant is attacked at all its stages of development by a disease called by the writer "Tremoco branco", and due, according to him, to a new species of *Gloeosporium*.

See also No. 975, B. June 1912; and No. 1245, B. Aug. 1912.
See No. 753, B. April 1912.

(Ed.).

(Ed.).

(*G. Lupinus* sp. nov.); the hybrid of the same white lupin grown at Campinas Institute proved resistant to the disease.

The first sign of infection is the appearance of blackish patches at the base of the leaves; these spread all round the petioles and cause withering of the leaves attacked. The disease shows its presence on the stalks by a black discoloration of parts of the cortical tissues, by formation of concave black patches. When these extend on to the stem, the plant dies and the roots rot.

According to the statement of the writer, the parasite may cause destruction of 90 per cent. of the plants.

As the use of remedies is impossible, the following preventive measures may be recommended: a) the cultivation of resistant varieties; b) selection of seeds from infected plants; c) leaving unsown soil which is infected by the fungus during preceding seasons; d) the scrupulous application of good cultural methods.

The writer has further observed that the white lupin and its hybrids are often attacked by *Heterodera radiculicola*. This nematode does not cause the death of the hybrid; it was found that the dead plants of white lupin were always infected also by *Gloeosporium*. It therefore seems probable that *Heterodera* merely weakens the plants upon which it lives and disposes them to fall victims to fungus parasites.

For the control of the nematode the writer advises, among other means, a change in rotation and the practising of good agricultural methods.

INSECT PESTS.

319 - The Nutrition Conditions of Certain Larvæ of Diptera, which are Parasitic on Fruit.

KEILIN, D. Structure du pharynx en fonction du régime chez les larvæ de Diptères cyclorhaphes. — *Comptes rendus hebdomadaires des Séances de l'Académie des Sciences*, Vol. 155, No. 26, pp. 1548-1550, figs. Paris, December 23, 1912.

Id. Sur les conditions de nutrition de certaines larvæ de Diptères parasites du fruit. — *Comptes rendus hebdomadaires des Séances de la Société de Biologie*, Vol. LXXI, pp. 24-26. Paris, January 10, 1913.

In his first article the writer showed by reference to numerous examples that the larvæ of certain *Diptera*, whether parasites of plants, animals, or predatory and carnivorous in their habits, in short such as generally live upon live tissues, never possess chitinous ribs or tracheal folds in their pharynx. These special structures on the other hand are always present in the pharynx of saprophagous larvæ, which feed upon decomposing animal or vegetable matter. In the same way larvæ can be found with and without these ribs according to their mode of living.

Amongst the *Trypetidae*, the writer has studied the larvæ of *Trypetes* sp. and of *Urophora* sp., both parasites on the capitula of *Cornus*. Their pharynx, like that of all other parasitic larvæ, is without ribs.

al wall, which is completely smooth. All the *Trypetidae* of which are known have been observed to be parasites of different plants, the stem, flowers or fruits.

Amongst the larvæ found on fruits (which the writer especially deals in second article) several are known to do much injury to crops; histories and the methods of their control have been the subject of much research.

Keilin has recently been able to examine two of these larvæ *Anastrepha ludens* Loew, from the ripe fruits of *Psidium* from Costa Rica, and *Dacus oleae* Meig., which, as is well known, damages olives. Contrary to previous observations, the writer found that these two larvæ possess sloped ribs like those of the saprophagous larvæ. Thus, in the family of the *Trypetidae* there are larvæ (*Trypeta* and *Urophora*) which have ribs, and others (*Anastrepha ludens* and *Dacus oleae*) which have ribs furnished with these longitudinal folds.

In order to explain this fact, it is necessary to suppose that the conditions in the fruits are from some points of view analogous to those of saprophagous existence, in which case it is requisite to determine the particular conditions which bring about this convergence.

Two contingencies are possible: a) The diastases of the fruits may perform an important function in the preparation of the nutritive medium for the larva; these diastases, having been derived from the cells which are destroyed by the ovipositor of the female at the moment of egg-laying, begin to digest the vegetable tissues situated near the egg. In the case of the olive is surrounded by a brownish zone. The larva, after hatching, destroys the cells in excavating a gallery and thus continues to provoke the emission of diastases. b) Or, on the other hand, diastases may not be derived from the fruit cells, but may be produced by the micro-organisms introduced by the ovipositor of the female and carried on progressively by the larva while making tunnels in the fruit, when the grub would be truly saprophagous. These two hypotheses are not contradictory, for it is very likely that the nutritive medium of the larva is prepared both by means of the fruit diastases and by the micro-organisms which were introduced with the egg.

In order to decide the writer that observations and experiments made are necessary to decide this question, interesting alike from the scientific and practical standpoints. It would be necessary to study the manner of feeding of these larvæ, in order to ascertain, for example, whether the larvæ of *Anastrepha ludens* and of *Dacus oleae* can be exterminated from the fruits without the intervention of a micro-organism; if this is impossible, it should be discovered whether this micro-organism is indispensable to the existence of the larva, is not always near the fruit. In the latter case, the destruction of the micro-organism would be another means of controlling the destructive insects.

320 - **The Control of Grasshoppers in South Africa (1).**

CARLE, G. La lutte contre les sauterelles dans les pays de l'Afrique du Sud, de Madagascar et Dépendances, *Bulletin économique*, Year 22, 2nd. Half-year No. 2, pp. 163-166. Tananarive, 1912.

In 1908, a special commission was appointed with the apt Lord Selborne, the then Commissioner for South Africa, to decide measures to be taken to prevent an invasion of locusts. The Commission was persuaded of the necessity of instituting a widespread preventive in all the colonies and territories under its supervision, especially as the appearance and effective methods for the control of these pests. It published the "Locust Bureau" for the study of the conditions of the appearance and control of this insect.

The British Colonies, the Territories of South Africa and the German South-West Africa and of Portuguese East Africa shared in the support of this bureau. The British possessions, the Cape of Good Hope, Natal, the Transvaal, the Orange River (now forming together the Union of South Africa), Southern Rhodesia and the Protectorates of Bechuanaland, Basutoland and Swaziland, had shown that the appearance of locusts within the territories included in the above-mentioned provinces depended on flights occurring in the bordering countries not within the sphere of British influence. The Commission was obliged to obtain at least annual reports on the existence of the locusts in the respective territories of the German Colonies of German East Africa, Nyasaland, N. E. Rhodesia and N. W. Rhodesia.

All the administrations took part in the work of the Bureau. Information relating to the flights of the locusts was sent to the Bureau at Pretoria.

The information thus obtained from various sources, was entered on a plan of conventional signs on a map. At the end of every year the Secretary sends to each administration a small map of South Africa showing at lat. 10° South, showing at a glance the condition of the locusts in the entire district. All the officials of the colonies and territories have already received postcards with a form on the back, on which they may be inscribed the characteristics of the flight (importance, direction, condition, etc.).

The commission meets annually in May to read and study the reports from the different districts. The total of these reports for 1909 forms the fourth annual report of the Bureau. Two reports from Portuguese East Africa are published by the portion of that province which is under the control of the Mozambique Company. It is to be noted that two territories, one belonging to the Nyassa Company and the other to the Mozambique Company, though united to Mozambique, yet are practically independent of the Government.

The reports described two species of injurious migratory locusts in South Africa, one with red wings (*Cyrtocantharis septemfasciata*) and

(1) See also No. 1521, B. May 1911.

own (*Pachytylus sulcicollis*); but it is probable that other locusts do some damage in South Africa.

The flight of *Locusta danina* was observed in 1907; some members of the Locust Bureau consider this species should be referred to the true locust; further some non-migratory locusts have been confused with migratory ones, even by experts on the subject. The public is invited to send to the Bureau specimens of any flight of which the members do not resemble either the brown locust or the true type with red wings known.

The eggs of the brown locust preserve their vitality for some years (about a half years being apparently the limit) when there is too little moisture to allow of their hatching. Slowly, but surely, the eggs in the end do perish.

The flights of locusts have not always attained the same importance in South Africa. The red-winged locusts appeared in Natal about 1893, but they had not been observed for fifty years; locusts only began doing some damage about 1890, but from that date the agriculturists have suffered every other year from the injury caused by these insects, while in the neighbourhood of Johannesburg it was even suggested to give up all cultivation of the ground, if the locusts had continued to make their appearance.

In the fourth report of the Bureau, it appears that in 1910 the locusts had already effected some damage in the German Colony of the South-West. In 1909, vast flights leaving the Kalahari desert spread over Cape Colony and the Orange River Colony and attained the coast between Port Elizabeth and East London. The locusts laid their eggs, but strong measures were taken as soon as these began to hatch out; and the remaining locusts fell a prey to birds.

At the present time, the Commission considers that those districts in South Africa which are under its control are practically secure from serious locust attacks. But it is imperatively necessary to exercise the most diligent supervision in order to be able to control the pest should it reappear.

As the result of experiments, the Locust Bureau expresses its preference for the control of these insects by arsenical mixtures applied to the ground at the moment of their emergence from the egg; but when they are on the move an aqueous solution of arsenate of copper is more effective. To this should be added a greater or less quantity of molasses or sugar. Apparatus have been supplied to all the branch offices of the Bureau; the insecticide ready prepared is put on the market and sold free or at reduced prices, thanks to Government subsidies. Control operations were directed by special "locust officers", assisted at times by soldiers.

The insecticide destroys at once the insects which it touches, but those which are not directly affected perish, being poisoned either by the grass with solution or by the dead poisoned locusts.

The insecticide now used in Africa is prepared under the care of the Locust Bureau in suitable iron receptacles containing 1 ½ gallons, and bearing

a special mark and the inscription locust poison. Every vessel costs 5 lbs. of arsenate of soda with 60 per cent. of arsenic, 1 gallon of molasses and 10 lbs. of brown sugar. To prepare this poison, 200 lbs. of arsenate of soda are dissolved in 15 gallons of boiling water and sufficient cold water is added to bring the amount up to 20 gallons. Into each receptacle poured half a gallon of this solution, to which is added later one gallon molasses, and the whole is carefully mixed. This constitutes the "Prepared Locust Poison".

In the circular of September 1, 1909, the Agricultural Department of the Transvaal advises the following mixture:

a) for locusts at least a fortnight old:

"Prepared Locust Poison"	1 part
Water	66 parts

b) for older locusts:

"Prepared Locust Poison"	1 part
Water	30 parts

Two labourers can prepare 200 receptacles per day.

	s	d
Each receptacle costs	1	0
The price of the contents is as follows:		
Molasses		7
Arsenate of soda	1	0
Mixing		1
Sundry expenses		2
Total	2s	10d

The solution should be sprinkled as sparingly as possible on the vegetation surrounding a swarm of sleeping locusts, or on a strip of ground 4 yards wide before a swarm on the wing; this prevents the grass or insects from being soaked with the solution. The locusts are attracted by the sugary liquid and are usually all killed in the space of a few hours.

The experiments of the "Locust Bureau" have shown that, in absence of all elementary precautions, the cattle of the regions where treatment is applied are not harmed. It is well to take some measures to guard against skin irritation during the use of the insecticide. The best remedy is to distribute the liquid in hermetically sealed vessels, ready to be put into the water, and to use a sprayer similar to that used for spraying vines.

321 - Campaign against *Agrotis ypsilon* in India (1).

Communication from Mr. W. B. HERCOCK, Director of Agriculture, Bihar and Orissa to the International Institute of Agriculture.

The campaign against *Agrotis ypsilon*, which was carried on by the Entomological Section of the Agricultural College at Sabour during

(1) See No. 83, B. Jan. 1913; No. 193, B. Feb. 1913.

four months of 1912, proved a complete success. About 120 000 moths caught during September, October and November. About 10 000 of land, which used to yield practically nothing on account of this pillar pest, will this year give an outturn worth 4 to 5 lakhs of s. The methods of procedure were: 1) attracting and killing the by means of 2 doz. Andres Maire traps and 2) picking off the first of caterpillars from the first attacked areas.

Results of Experiments in the Control of Olive Fly made in France from 1907 to 1912 (1).

PARIS. La lutte contre la mouche de l'olive. — Résultats des expériences du Service de l'Oléiculture. (Année 1912). — *Bulletin mensuel de l'Office de Renseignements Agricoles*, Year 11, No. 12, pp. 1703-1707. Paris, December 1912.

The writer, who is the Inspector-Director of the Service of Olive-growing France, has made many experiments at different places in the South France during the last six years upon the control of the olive fly (*Dacus*).

These experiments have led to the following conclusions:

1. Sprays with arsenical molasses made from June to October reduce the damage caused by the insect; and if applied over large areas, or planted plantations, the crop is completely protected. In the latter case, number of sprays may be reduced.

2. Dry treatment by means of different kinds of poisoned bait spread throughout the oliveyards had no appreciable effect.

3. Mixed treatments were successful, but the experiment of 1910 shows that in these the spraying is the only active agent.

The use of strong doses of sugary washes does not promote, as might be expected, the propagation of fumagine, for the small quantities of molasses sprayed on the trees are removed by the first showers of rain.

Nearly the practical method of combating the olive-fly is spraying a wash prepared according to the following formula:

Molasses containing 2.5 per cent. of arsenate of soda	15 lbs.
Water to make up.	10 gallons.

This mixture should be applied to the trees in very small quantities (1 gallon to 12 or 15 trees at each spraying) and by means of ordinary nozzles furnished with straight jets.

When the oliveyard, from its extent or isolation, offers unusually unfavourable conditions for treatment, safety can be obtained with two sprayings, the first applied at the beginning of July and the second at the end of August when the infested trees chiefly harbour pupae (usually early in September).

(1) See also No. 1051, *B.* March 1911; No. 2369, *B.* July 1911; No. 3065, *B.* Aug-Oct. 1911; No. 721, *B.* April 1912. (Ed.).

In districts where the crop is late (Maritime Alps, Corsica), it is necessary to watch the evolution of the parasite and, if necessary, to spray a third time in the autumn.

The writer, in conclusion, draws attention to the fact, that under favourable circumstances than those which attended his experience (great extent of the oliveyard, its isolation, extreme susceptibility of olive trees to the parasite), if the protection afforded is not complete, the amount of disease is noticeably reduced and the returns thus obtained from the crop more than compensate for the expenses incurred.

323 - Experiments in the Control of the Olive Fly by Means of Traps at Poggio Mirteto (Umbria) in 1912.

GORNI, O. and PASSALACQUA, P. Esperienze di lotta contro la mosca delle olive, con l'uso di trappole a Poggio Mirteto col sistema delle capannette del prof. Lotrionte e dirette dalla Camera di Agricoltura per la Sabina nel 1912. — *L'Italia Agricola*, Year 1, No. 1, pp. 19-20. Piacenza, January 15, 1913.

This experiment was carried out in an oliveyard in the hills of a conical shape and containing about 1100 trees of the Carboncella variety, most of which were mature, while all were in good condition. As the oliveyard was not isolated, an attempt was made to protect at least the central portion, by making an artificial barrier against the olive fly. To do this, every tree in the two or three outermost rows was provided with two olive-fly traps ("capannette dachicidae") (1). On each of the trees only one trap was affixed; the total number used was 1200. From July 3 to October 10, 1912, the traps were sprayed 6 times.

On a first visit to the oliveyard, made on September 10, the writer found considerable infection in the case of about fifty trees of the variety on the south of the oliveyard; but the others were practically free. The fact is to be attributed to the presence of numerous buildings on the southern part of the oliveyard and especially of brick kilns, which were in work throughout the year, and afforded a comfortable and safe shelter to pupæ and adult hibernating flies during the winter. Infection to

(1) The "capannetta dachicida", recently devised by Prof. Lotrionte, Director of the Chair of Agriculture of Tivoli (Rome Province); is a small shelter made of tin, or of galvanized iron, 10 by 14 in., bent into one or two ridges, and containing a small bundle of twigs, rather loosely tied together, and projecting somewhat from the sides of the shelter. Two pieces of twine, or preferably wire, serve to keep the shelter in shape, secure it to the tree, and suspend it from one of the horizontal branches of the tree. To attract the insect, the bundle of dry twigs is sprayed four or five times during the season with a poisonous mixture. Prof. Lotrionte's formula is 50 to 60 lbs. liquid glucose, 2 lbs. arsenite of soda, 2 lbs. borate of soda and water to make up to 10 gallons. It is calculated that 44 galls of this mixture suffice for 1000 traps. The mixture is sprayed onto the twigs with a hand sprayer with extension rod; a man can spray 600 to 700 in the day. Each trap costs 20 cents on the tree, and may last four to six years, especially if made of galvanized iron. The cost of four treatments is about 1 1/4 d per tree. The experiments made with this system in 1911 in the provinces of Rome, Perugia, Pisa, and Lecce gave excellent results. Cf. *Giornale di Difesa contro la mosca olearia*. — *Il Coltivatore*, Year 58, No. 36, pp. 593-597, fig. 108. (Ed.)
Monferrato, December 30, 1912.

of 25 per cent. occurred throughout the neighbouring control plantations.

From the final results ascertained on the occasion of a visit paid November 10, it appeared that in the outermost zone on the north, east and west sides, that is to say in the case of the trees in immediate contact with the control oliveyards in which no sort of treatment had been carried out, the average infection was 50 per cent. But on proceeding towards the centre and south side, the disease decreased sensibly, and in the central zone the infection was only 20 per cent.

The observation made in the southern part, where the trees were more numerous and laden with fruit, is interesting. The infection, which showed itself here first and to a somewhat noticeable extent, was afterwards completely arrested in such a manner that at the time of the last visit, five fruits seemed almost all to be free from the fly* (5 per cent. infected); the writers believe that, though the infection had set in here owing to the presence of the brick kilns, the traps were able to keep it in check; and as this part was furthest from neighbouring plantations, it was less liable to subsequent re-infection.

In the control oliveyards close by, the infection varied from 95 to 100 per cent.; and in the rest of the territory of Poggio Mirteto it was 90 per cent.

Even the conditions of the experiment, the writers consider the results obtained to be satisfactory and that the traps would yield better results with a more extensive zone of protection.

A Practical and Efficacious Remedy against the Woolly Aphis (*Schizoneura lanigera*).

DUBREIL, ARTHUR. Le Puceron lanigère: un remède pratique et efficace. — *Le Progrès agricole et viticole* (Édition de l'Est-Centre), Year 34, No. 2, pp. 52-53. Montpellier, January 12, 1913.

The writer recommends as a remedy against the woolly aphis (*Schizoneura lanigera*), which is certainly one of the most difficult insects to destroy, the use of commercial oil paint, as being a simple, practical and efficacious substance ensuring the destruction of the colonies of aphides. The paint can be prepared on the farm according to the following for-

linseed oil	7 lbs.
white lead	1 ½ lb.
oxide of zinc	1 lb.

The mixture is boiled for 10 minutes, and when cold 1 lb. of turpentine is added. The paint is applied by means of a brush to all the infected trees. As a rule, one application is sufficient; but in order to be quite safe, it may be made, in the autumn and at the end of June. By the use of this remedy the writer was able to save some old apple trees which had been very severely attacked by *Schizoneura lanigera*.

325 - *Bixadus sierricola*, an Enemy of *Coffea Arabica* in the
 gian Congo.

MAYNÉ, R. Un ennemi sérieux du *Coffea Arabica* au Congo Belge (*Bixadus*
 Wh.). — *Bulletin Agricole du Congo Belge*, Vol. III, No. 4, pp. 911-917, fig.
 Brussels, December 1912.

Bixadus sierricola is a beetle already known as a coffee pest in Africa. The insect reproduces itself annually. The adults appear morning from early October to the beginning of January, on the of the coffee trees upon which they completed their development, or neighbouring shrubs. The eggs are laid towards the end of Sept and probably until the close of December at 6 to 12 inches above the g exceptionally on three-year-old plants, often on those which are 4 or 5 old, but especially on old trees, whether they are weak or vigorous. The writer was not able to observe with precision the length of the egg, nor the exact time at which the young larvae appear, but he has seen the occurrence of some fairly well developed larvae on a certain number of trees as early as the second half of March. Anyway, the larval stage in which *Bixadus* does a great deal of injury, can be divided into three distinct periods. In the first the young larvae, as soon as they are hatched, destroy the cortex and the cambium zone by excavating galleries. In the second, they penetrate into the roots, where they also make wide tunnels. In the third, returning to the exterior of the roots, they devour all the bark and part of the wood of the latter, which become almost completely detached from the tree owing to the successive attacks of fungi, then the larvae of Elaterids and species of Scarabeids; the tree thus loses its stability, bends towards the ground and becomes gradually weaker, until the insect pursues its work of destruction. The trees, however, are not making wound tissues from which numerous adventitious roots develop. They are only to be destroyed in their turn by successive generations of *B.* assisted by the previously mentioned pests.

The coffee trees in consequence become chlorotic, their fruit does not ripen and after some years of repeated attacks they die from exhaustion. At the close of the third period, the larvae ascend once more to the top of the stem and remain in the ligneous and cambium zones, but especially in the former.

At the end of August and the beginning of September, the larvae begin to pupate; the pupal period varies from 30 to 45 days (40 to 45 in the case of males).

Means of control: the best is the capture of the insects at the commencement of the rainy season (October). The direct destruction of the larvae is difficult and little practised, but it is well to hunt for them during the first period of their existence. The writer has made experiments against larvae in the third period of their development by injecting carbon disulphide, but with little success as the pests are protected in their galleries by plugs made of scraps of wood.

To meet with success in the attempt, it is better to defer it to the end of the metamorphosis (September), when a hole can be drilled to meet

and a plug introduced, which is impregnated with carbon disulphide in a mixture of ordinary petroleum and carbon disulphide; the aperture should be stopped up afterwards with clay, smeared over in its turn with coal-tar. Four fifths of the plants thus treated were freed from the insects.

Amongst the various preventive methods, the writer mentions two which seem to yield good results.

First, when the adult beetles leave the host plant by a hole near the ground, it is important that the whole of the trunk of the tree should remain exposed to ensure the escape of the insects. Immediately this has taken place the trunk should be scraped to a height of about 16 inches, and this must be covered with coal-tar. The operation should be performed in the second half of September, the old holes from which the insects escaped being stopped up with clay as a preventive measure. It is necessary to bank up the earth round the trunk of the plants attacked to give them a firmer hold of the ground.

The second method consists in substituting the following mixture for the first in order to prevent the deposition of the eggs of *Bixadus*. Four ounces of soft soap are dissolved in the same amount of hot water; to this is added half a gallon of carbolic acid. The mixture is left standing for 24 hours when it is diluted with from 32 to 40 gallons of rain water till it attains a homogeneous consistency.

However, a plantation has been infested for some years, it is best to pull up the plants which are attacked at the time when the larvae inhabit the soil, and to give up coffee cultivation for a few years.

The Tobacco Thrips and its Ravages in Hungary.

Dr. ELEMER. (Attached to the Experiment Station for the Cultivation of Tobacco at Szeged.) A *Thrips tabaci* kártétele Magyarországon. — *Magyar Dohányfajlag*, XXX, No. 1, pp. 6-9. Budapest, January 5, 1913.

The tobacco thrips, observed for the first time in Hungary in the year 1908, the model nurseries of the Government at Arad by M. Coloman Kertész, Director of the Agricultural Academy and the Experiment Station for Tobacco Cultivation, has spread with increasing rapidity from that time. In 1908, the writer recorded the presence of *Thrips tabaci* in 7 districts of the country, two of which, Arad and Temes, had suffered considerably. In 1909, the invasion was of less severity, a fact due to the season being unfavourable to the propagation of the parasite; but now the latter has extended even to the eastern portion of Hungary. Nevertheless, *tabaci* is little known to tobacco-growers, who attribute its ravages to the weather.

It is known that this parasite only attacks the leaves of the tobacco, and that it destroys the chlorophyll. White patches occur where the leaf is punctured; and, as the insect is too small to be easily seen, the tobacco growers often complain that their plants become lighter in every year. The leaves which are attacked lose 30 to 40 per cent. in quantity and quality. The writer saw some leaves of garden to-

bacco of the Réthaz variety, which had deteriorated 80 per cent. the varieties grown do not suffer to the same extent from this pest; there are some which the tobacco thrips attacks by preference, such as cigar tobacco, while the tobaccos of Szeged, Szamoshat and the region of Tisza are almost free from its ravages.

This very injurious insect has also made its appearance in other parts. In 1878 *Thrips tabaci* was observed for the first time in Bessarabia, and the havoc it wrought was so great that the Russian Government deputed M. Lindemann, Director of the Agricultural Academy at Moscow, to the infected zone and try to discover a suitable method of control. The scientist obtained excellent results with an insecticide powder and spraying with petroleum emulsion.

In Rumania, which is a very important centre of tobacco culture and where the crops had been much injured, various methods of control were used with success.

The writer, while admitting the efficacy of these methods, says, taking into account the difficulty of their application in Hungary, the remedy which can now be applied in that country is as follows: If *T. tabaci* has already made its appearance upon the young greenhouse plants the lower leaves of the stems must be removed and burnt, as it is known that at this time the insect is to be found chiefly upon these parts of the plant.

But if the tobacco is attacked after it has been planted out, it is necessary at once after the harvest to plough the infected plots very deep; by this means the cut stems will be buried so deep that the eggs or larvae upon them will, in any case, perish.

327 - The Phoenix Skipper (*Pamphila dysmephila* Trim.).

KELLY, ALBERT, in *The Agricultural Journal of the Union of South Africa*, Vol. No. 6, pp. 876-882, 1 fig., plates I-V. Pretoria, December 1912.

For some years, *Phoenix reclinata*, Jacq., which promised to be a prominent garden plant in Natal, has been much injured by the attack of *Pamphila dysmephila* Trim., an African butterfly belonging to the group popularly known as skippers. The insect, which was first observed on some specimens of Phoenix palms in the Government Gardens in Durban, causes in its larval condition a peculiar and extensive defoliation of the plants attacked. Almost at once on emerging from the egg, the caterpillar joins the outside edges of the leaf with silken threads, thus forming a tunnel where it can lie concealed. Then it begins to devour the tissue of the leaf, the tube being extended gradually backward as the leaf is destroyed, thus affording a fresh place of concealment. Two or three caterpillars are sufficient to destroy a whole leaf.

Hand-picking and destroying the larvae are the best methods of control. The eggs are more visible than the larvae, and if these are destroyed much injury can be prevented. It is, however, very necessary to institute a keen and regular inspection, as much damage may be done before the existence of the larvae is observed.

raying with arsenate of lead at the rate of 3 lbs. to 50 gallons of water substituted for hand-picking, but better still, may be regarded as a supplementary treatment.

***Vesperus xanthi*, a Serious Enemy to the Vine in Catalonia (Spain).**

insecto que causa graves daños a los viñedos. — *Revista del Instituto Agrícola de San Isidro y Orfano de la Federación Agrícola Catalana-Baleár*, Year LXII t 2, pp. 23-26. Barcelona, January 20, 1913.

For the last two years, a disease has been observed in some of the vines of Penadés, which has destroyed a large number of vines. The symptoms resemble those of the so-called "apoplexy" (in Catalan dialect "ura"), so that the injury has generally been attributed to this disease. Recently, however, as the larvae of *Vesperus xanthi* (commonly known as "Mallols") have been discovered in the disturbed soil of a vineyard in the district, which has suffered severely, it is thought that the injury which has been noticed in the Penadés should be attributed to the vine weevil.

INJURIOUS VERTEBRATES.

The Control of Field Voles in Italy. (1)

GRU, G. Contro i topi campagnoli. — *L'Italia Agricola*, Year XLIX, No. 24, pp. 581-582, 1 fig. Piacenza, December 30, 1912.

Since 1911, the different products of the soil, and especially crops of cereals, have been considerably damaged by field voles throughout the northern part of North and Central Italy. In the Province of Modena and the other provinces on the borders of Emilia, a bait (crushed maize) impregnated with phosphate of zinc has been adopted as a simple, practical, and relatively cheap means of controlling these pests.

In order to be efficacious, this method must be applied to all ground covered by lucerne, to pastures, both permanent and temporary, to drainage ditches, as well as to all cart tracks which traverse cultivated land. The bait should be spread during September and October, as at that time the voles are most numerous and feed chiefly on meadow grass. It is also an opportune moment, as it immediately precedes wheat-sowing.

When thoroughly carried out, this method gives excellent results; within a few hours after the poisoned maize is laid down, the destruction of the voles commences, and it continues for four or five days; the number of voles which survive the treatment is very small.

Nevertheless, just in those zones of the province of Modena where this method had been most carefully used in September 1912, considerable

See also No. 1488; *B. Oct.* 1912 and No. 1567, *B. Nov.* 1912.

damage to the wheat-fields was noticeable towards the end of the year. The observations made by the writer showed that the greater part of the destruction was due to the last generation of field voles; during September and October these were being suckled by their mothers and were not on ploughed land, which, from mistaken motives of economy, has not been treated by the farmers.

Given the rapidity of reproduction of the field vole and its large numbers together with the ease with which it spreads from the centres of infestation to the neighbouring district, the writer considers that for the control of this animal to be efficient, it will be necessary for a special law to be passed obliging the infested provinces to adopt a uniform method of control from the same date.

